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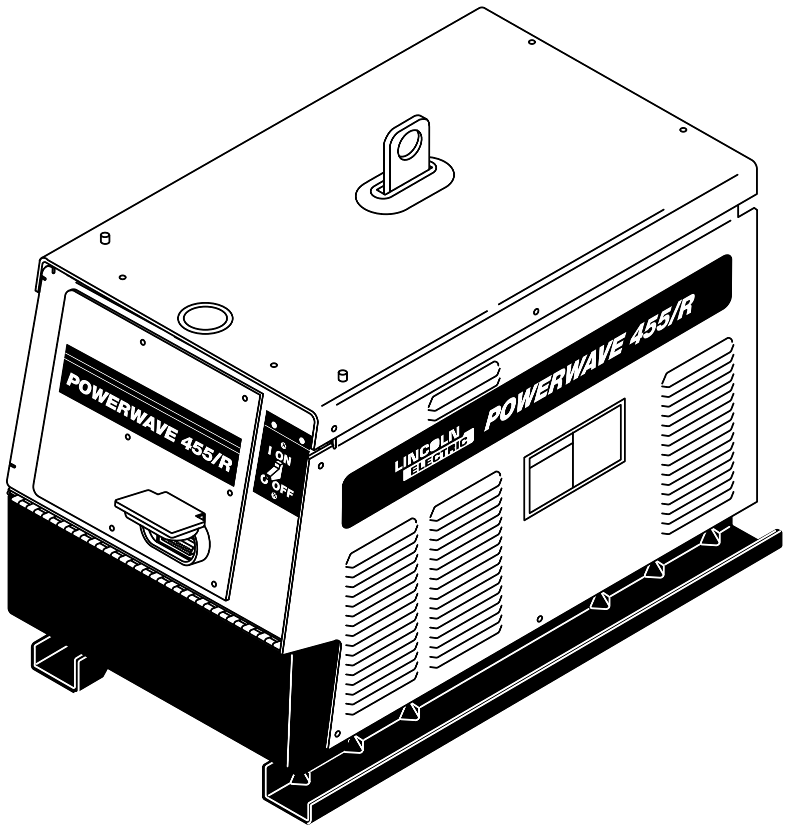
Return to Master TOC
View Safety Info
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SVM156-A

October, 2001

POWER WAVE™ 455/R

For use with machines having Code Numbers: **10675**
10676



Safety Depends on You

Lincoln arc welding and cutting equipment is designed and built with safety in mind. However, your overall safety can be increased by proper installation . . . and thoughtful operation on your part. **DO NOT INSTALL, OPERATE OR REPAIR THIS EQUIPMENT WITHOUT READING THIS MANUAL AND THE SAFETY PRECAUTIONS CONTAINED THROUGHOUT.** And, most importantly, think before you act and be careful.

IEC 60974-1

SERVICE MANUAL

LINCOLN® ELECTRIC

• World's Leader in Welding and Cutting Products •
• Sales and Service through Subsidiaries and Distributors Worldwide •
Cleveland, Ohio 44117-1199 U.S.A. TEL: 216.481.8100 FAX: 216.486.1751 WEB SITE: www.lincolnelectric.com

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SAFETY

WARNING

CALIFORNIA PROPOSITION 65 WARNINGS

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

The Above For Diesel Engines

The engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm.

The Above For Gasoline Engines

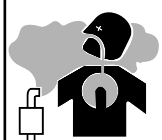
ARC WELDING can be hazardous. PROTECT YOURSELF AND OTHERS FROM POSSIBLE SERIOUS INJURY OR DEATH. KEEP CHILDREN AWAY. PACEMAKER WEARERS SHOULD CONSULT WITH THEIR DOCTOR BEFORE OPERATING.

Read and understand the following safety highlights. For additional safety information, it is strongly recommended that you purchase a copy of “Safety in Welding & Cutting - ANSI Standard Z49.1” from the American Welding Society, P.O. Box 351040, Miami, Florida 33135 or CSA Standard W117.2-1974. A Free copy of “Arc Welding Safety” booklet E205 is available from the Lincoln Electric Company, 22801 St. Clair Avenue, Cleveland, Ohio 44117-1199.

BE SURE THAT ALL INSTALLATION, OPERATION, MAINTENANCE AND REPAIR PROCEDURES ARE PERFORMED ONLY BY QUALIFIED INDIVIDUALS.

FOR ENGINE powered equipment.

1.a. Turn the engine off before troubleshooting and maintenance work unless the maintenance work requires it to be running.



1.b. Operate engines in open, well-ventilated areas or vent the engine exhaust fumes outdoors.



1.c. Do not add the fuel near an open flame welding arc or when the engine is running. Stop the engine and allow it to cool before refueling to prevent spilled fuel from vaporizing on contact with hot engine parts and igniting. Do not spill fuel when filling tank. If fuel is spilled, wipe it up and do not start engine until fumes have been eliminated.

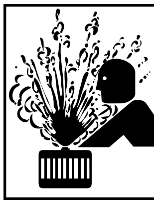


1.d. Keep all equipment safety guards, covers and devices in position and in good repair.Keep hands, hair, clothing and tools away from V-belts, gears, fans and all other moving parts when starting, operating or repairing equipment.

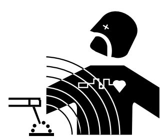
1.e. In some cases it may be necessary to remove safety guards to perform required maintenance. Remove guards only when necessary and replace them when the maintenance requiring their removal is complete. Always use the greatest care when working near moving parts.

1.f. Do not put your hands near the engine fan. Do not attempt to override the governor or idler by pushing on the throttle control rods while the engine is running.

1.g. To prevent accidentally starting gasoline engines while turning the engine or welding generator during maintenance work, disconnect the spark plug wires, distributor cap or magneto wire as appropriate.



1.h. To avoid scalding, do not remove the radiator pressure cap when the engine is hot.



ELECTRIC AND MAGNETIC FIELDS may be dangerous

2.a. Electric current flowing through any conductor causes localized Electric and Magnetic Fields (EMF). Welding current creates EMF fields around welding cables and welding machines

2.b. EMF fields may interfere with some pacemakers, and welders having a pacemaker should consult their physician before welding.

2.c. Exposure to EMF fields in welding may have other health effects which are now not known.

2.d. All welders should use the following procedures in order to minimize exposure to EMF fields from the welding circuit:

2.d.1. Route the electrode and work cables together - Secure them with tape when possible.

2.d.2. Never coil the electrode lead around your body.

2.d.3. Do not place your body between the electrode and work cables. If the electrode cable is on your right side, the work cable should also be on your right side.

2.d.4. Connect the work cable to the workpiece as close as possible to the area being welded.

2.d.5. Do not work next to welding power source.

Mar ‘95

Return to Master TOC
Return to Master TOC
Return to Master TOC
Return to Master TOC



ELECTRIC SHOCK can kill.

3.a. The electrode and work (or ground) circuits are electrically "hot" when the welder is on. Do not touch these "hot" parts with your bare skin or wet clothing. Wear dry, hole-free gloves to insulate hands.

3.b. Insulate yourself from work and ground using dry insulation. Make certain the insulation is large enough to cover your full area of physical contact with work and ground.

In addition to the normal safety precautions, if welding must be performed under electrically hazardous conditions (in damp locations or while wearing wet clothing; on metal structures such as floors, gratings or scaffolds; when in cramped positions such as sitting, kneeling or lying, if there is a high risk of unavoidable or accidental contact with the workpiece or ground) use the following equipment:

- **Semiautomatic DC Constant Voltage (Wire) Welder.**
- **DC Manual (Stick) Welder.**
- **AC Welder with Reduced Voltage Control.**

3.c. In semiautomatic or automatic wire welding, the electrode, electrode reel, welding head, nozzle or semiautomatic welding gun are also electrically "hot".

3.d. Always be sure the work cable makes a good electrical connection with the metal being welded. The connection should be as close as possible to the area being welded.

3.e. Ground the work or metal to be welded to a good electrical (earth) ground.

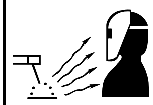
3.f. Maintain the electrode holder, work clamp, welding cable and welding machine in good, safe operating condition. Replace damaged insulation.

3.g. Never dip the electrode in water for cooling.

3.h. Never simultaneously touch electrically "hot" parts of electrode holders connected to two welders because voltage between the two can be the total of the open circuit voltage of both welders.

3.i. When working above floor level, use a safety belt to protect yourself from a fall should you get a shock.

3.j. Also see Items 6.c. and 8.

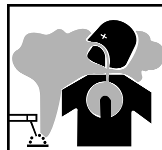


ARC RAYS can burn.

4.a. Use a shield with the proper filter and cover plates to protect your eyes from sparks and the rays of the arc when welding or observing open arc welding. Headshield and filter lens should conform to ANSI Z87. I standards.

4.b. Use suitable clothing made from durable flame-resistant material to protect your skin and that of your helpers from the arc rays.

4.c. Protect other nearby personnel with suitable, non-flammable screening and/or warn them not to watch the arc nor expose themselves to the arc rays or to hot spatter or metal.



FUMES AND GASES can be dangerous.

5.a. Welding may produce fumes and gases hazardous to health. Avoid breathing these fumes and gases.When welding, keep your head out of the fume. Use enough ventilation and/or exhaust at the arc to keep fumes and gases away from the breathing zone. **When welding with electrodes which require special ventilation such as stainless or hard facing (see instructions on container or MSDS) or on lead or cadmium plated steel and other metals or coatings which produce highly toxic fumes, keep exposure as low as possible and below Threshold Limit Values (TLV) using local exhaust or mechanical ventilation. In confined spaces or in some circumstances, outdoors, a respirator may be required. Additional precautions are also required when welding on galvanized steel.**

5.b. Do not weld in locations near chlorinated hydrocarbon vapors coming from degreasing, cleaning or spraying operations. The heat and rays of the arc can react with solvent vapors to form phosgene, a highly toxic gas, and other irritating products.

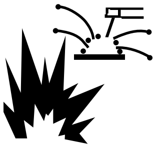
5.c. Shielding gases used for arc welding can displace air and cause injury or death. Always use enough ventilation, especially in confined areas, to insure breathing air is safe.

5.d. Read and understand the manufacturer's instructions for this equipment and the consumables to be used, including the material safety data sheet (MSDS) and follow your employer's safety practices. MSDS forms are available from your welding distributor or from the manufacturer.

5.e. Also see item 1.b.

Mar '95

Return to Master TOC
Return to Master TOC
Return to Master TOC
Return to Master TOC



WELDING SPARKS can cause fire or explosion.

6.a. Remove fire hazards from the welding area. If this is not possible, cover them to prevent the welding sparks from starting a fire. Remember that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas. Avoid welding near hydraulic lines. Have a fire extinguisher readily available.

6.b. Where compressed gases are to be used at the job site, special precautions should be used to prevent hazardous situations. Refer to “Safety in Welding and Cutting” (ANSI Standard Z49.1) and the operating information for the equipment being used.

6.c. When not welding, make certain no part of the electrode circuit is touching the work or ground. Accidental contact can cause overheating and create a fire hazard.

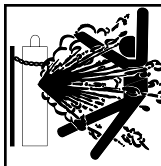
6.d. Do not heat, cut or weld tanks, drums or containers until the proper steps have been taken to insure that such procedures will not cause flammable or toxic vapors from substances inside. They can cause an explosion even though they have been “cleaned”. For information, purchase “Recommended Safe Practices for the Preparation for Welding and Cutting of Containers and Piping That Have Held Hazardous Substances”, AWS F4.1 from the American Welding Society (see address above).

6.e. Vent hollow castings or containers before heating, cutting or welding. They may explode.

6.f. Sparks and spatter are thrown from the welding arc. Wear oil free protective garments such as leather gloves, heavy shirt, cuffless trousers, high shoes and a cap over your hair. Wear ear plugs when welding out of position or in confined places. Always wear safety glasses with side shields when in a welding area.

6.g. Connect the work cable to the work as close to the welding area as practical. Work cables connected to the building framework or other locations away from the welding area increase the possibility of the welding current passing through lifting chains, crane cables or other alternate circuits. This can create fire hazards or overheat lifting chains or cables until they fail.

6.h. Also see item 1.c.



CYLINDER may explode if damaged.

7.a. Use only compressed gas cylinders containing the correct shielding gas for the process used and properly operating regulators designed for the gas and pressure used. All hoses, fittings, etc. should be suitable for the application and maintained in good condition.

7.b. Always keep cylinders in an upright position securely chained to an undercarriage or fixed support.

7.c. Cylinders should be located:
- Away from areas where they may be struck or subjected to physical damage.
- A safe distance from arc welding or cutting operations and any other source of heat, sparks, or flame.

7.d. Never allow the electrode, electrode holder or any other electrically “hot” parts to touch a cylinder.

7.e. Keep your head and face away from the cylinder valve outlet when opening the cylinder valve.

7.f. Valve protection caps should always be in place and hand tight except when the cylinder is in use or connected for use.

7.g. Read and follow the instructions on compressed gas cylinders, associated equipment, and CGA publication P-l, “Precautions for Safe Handling of Compressed Gases in Cylinders,” available from the Compressed Gas Association 1235 Jefferson Davis Highway, Arlington, VA 22202.



FOR ELECTRICALLY powered equipment.

8.a. Turn off input power using the disconnect switch at the fuse box before working on the equipment.

8.b. Install equipment in accordance with the U.S. National Electrical Code, all local codes and the manufacturer’s recommendations.

8.c. Ground the equipment in accordance with the U.S. National Electrical Code and the manufacturer’s recommendations.

Mar ‘95

PRÉCAUTIONS DE SÛRETÉ

Pour votre propre protection lire et observer toutes les instructions et les précautions de sûreté specifiques qui parraissent dans ce manuel aussi bien que les précautions de sûreté générales suivantes:

Sûreté Pour Soudage A L'Arc

1. Protegez-vous contre la secousse électrique:

   a. Les circuits à l'électrode et à la piéce sont sous tension quand la machine à souder est en marche. Eviter toujours tout contact entre les parties sous tension et la peau nue ou les vétements mouillés. Porter des gants secs et sans trous pour isoler les mains.
   b. Faire trés attention de bien s'isoler de la masse quand on soude dans des endroits humides, ou sur un plancher metallique ou des grilles metalliques, principalement dans les positions assis ou couché pour lesquelles une grande partie du corps peut être en contact avec la masse.
   c. Maintenir le porte-électrode, la pince de masse, le câble de soudage et la machine à souder en bon et sûr état defonctionnement.
   d. Ne jamais plonger le porte-électrode dans l'eau pour le refroidir.
   e. Ne jamais toucher simultanément les parties sous tension des porte-électrodes connectés à deux machines à souder parce que la tension entre les deux pinces peut être le total de la tension à vide des deux machines.
   f. Si on utilise la machine à souder comme une source de courant pour soudage semi-automatique, ces precautions pour le porte-électrode s'applicuent aussi au pistolet de soudage.

2. Dans le cas de travail au dessus du niveau du sol, se protéger contre les chutes dans le cas ou on recoit un choc. Ne jamais enrouler le câble-électrode autour de n'importe quelle partie du corps.

3. Un coup d'arc peut être plus sévère qu'un coup de soliel, donc:

   a. Utiliser un bon masque avec un verre filtrant approprié ainsi qu'un verre blanc afin de se protéger les yeux du rayonnement de l'arc et des projections quand on soude ou quand on regarde l'arc.
   b. Porter des vêtements convenables afin de protéger la peau de soudeur et des aides contre le rayonnement de l'arc.
   c. Protéger l'autre personnel travaillant à proximité au soudage à l'aide d'écrans appropriés et non-inflammables.

4. Des gouttes de laitier en fusion sont émises de l'arc de soudage. Se protéger avec des vêtements de protection libres de l'huile, tels que les gants en cuir, chemise épaisse, pantalons sans revers, et chaussures montantes.

5. Toujours porter des lunettes de sécurité dans la zone de soudage. Utiliser des lunettes avec écrans lateraux dans les zones où l'on pique le laitier.

6. Eloigner les matériaux inflammables ou les recouvrir afin de prévenir tout risque d'incendie dû aux étincelles.

7. Quand on ne soude pas, poser la pince à une endroit isolé de la masse. Un court-circuit accidental peut provoquer un échauffement et un risque d'incendie.

8. S'assurer que la masse est connectée le plus prés possible de la zone de travail qu'il est pratique de le faire. Si on place la masse sur la charpente de la construction ou d'autres endroits éloignés de la zone de travail, on augmente le risque de voir passer le courant de soudage par les chaines de levage, câbles de grue, ou autres circuits. Cela peut provoquer des risques d'incendie ou d'echauffement des chaines et des câbles jusqu'à ce qu'ils se rompent.

9. Assurer une ventilation suffisante dans la zone de soudage. Ceci est particuliérement important pour le soudage de tôles galvanisées plombées, ou cadmiées ou tout autre métal qui produit des fumeés toxiques.

10. Ne pas souder en présence de vapeurs de chlore provenant d'opérations de dégraissage, nettoyage ou pistolage. La chaleur ou les rayons de l'arc peuvent réagir avec les vapeurs du solvant pour produire du phosgéne (gas fortement toxique) ou autres produits irritants.

11. Pour obtenir de plus amples renseignements sur la sûreté, voir le code "Code for safety in welding and cutting" CSA Standard W 117.2-1974.

PRÉCAUTIONS DE SÛRETÉ POUR LES MACHINES À SOUDER À TRANSFORMATEUR ET À REDRESSEUR

1. Relier à la terre le chassis du poste conformement au code de l'électricité et aux recommendations du fabricant. Le dispositif de montage ou la piece à souder doit être branché à une bonne mise à la terre.

2. Autant que possible, l'installation et l'entretien du poste seront effectués par un électricien qualifié.

3. Avant de faires des travaux à l'interieur de poste, la debrancher à l'interrupteur à la boite de fusibles.

4. Garder tous les couvercles et dispositifs de sûreté à leur place.

Mar. '93

- MASTER TABLE OF CONTENTS FOR ALL SECTIONS -

RETURN TO MAIN MENU

Return to Master TOC
Return to Master TOC
Return to Master TOC
Return to Master TOC

TABLE OF CONTENTS
- INSTALLATION SECTION -

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

TECHNICAL SPECIFICATIONS - POWER WAVE 455/R (K1761-1), (K1761-2)

INPUT AT RATED OUTPUT - THREE PHASE ONLY

INPUT VOLTS	OUTPUT CONDITIONS	INPUT CURRENT AMPS	IDLE POWER	POWER FACTOR @ RATED OUTPUT	EFFICIENCY @ RATED OUTPUT
(K1761-1) 208/230/460V - 60HZ	450A@38V 100% 570A@43V 60%	70/65/35 87/82/48	400 Watts MAX	0.89 MIN	88%
200/220/440V - 50HZ	400A@36V 100% 500A@40V 60%	64/58/32 79/74/41			
(K1761-2) 208/230/460/575V-60HZ	450@38V 100% 570@43V 60%	58/53/25/22 82/78/37/31		0.95 MIN	
200/220/440V - 50HZ	400@36V 100% 500A@40V 60%	49/45/23 67/61/31			

OUTPUT

OPEN CIRCUIT VOLTAGE	CURRENT RANGE	PULSE FREQUENCY	PULSE VOLTAGE RANGE	PULSE AND BACKGROUND TIME RANGE	STT PARAMETERS	AUXILIARY POWER (CIRCUIT BREAKER PROTECTED)
75 VDC	5 - 570	0.15 - 1000 Hz	5 - 55 VDC	100 MICRO SEC. -3.3 SEC.	40-325 AMPS	40 VDC @10 AMPS 115VAC @10 AMPS

PROCESS CURRENT RANGES (DC)	CURRENT
MIG/MAG	50-570 Average Amps
FCAW	40-570 Average Amps
SMAW	30-570 Average Amps
Pulse	5-750 Peak Amps
STT	40-325 Average Amps

RECOMMENDED INPUT WIRE AND FUSE SIZES

INPUT VOLTAGE / FREQUENCY	AMPS/ DUTY CYCLE	INPUT AMPERE RATING ON NAMEPLATE	TYPE 75°C COPPER WIRE IN CONDUIT AWG[IEC] SIZES (mm2)	TYPE 75°C GROUND WIRE IN CONDUIT AWG[IEC] SIZES (mm2)	TYPE 75°C (SUPER LAG) OR BREAKER SIZE (AMPS)
(K1761-1)					
208/230V - 60HZ	450/100%	70/65	4 (25)	8 (10)	90/90
460V - 60HZ	450/100%	35	8 (10)	10 (6)	45
200/220V - 50HZ	400/100%	64/58	4 (25)	8 (10)	90/80
440V - 50HZ	400/100%	32	8 (10)	10 (6)	45
208/230V - 60HZ	570/60%	87/82	4 (25)	6 (10)	110/110
460V - 60HZ	570/60%	48	8 (10)	10 (6)	70
200/220V - 50HZ	500/60%	79/74	4 (25)	8 (10)	100/100
440V - 50HZ	500/60%	41	8 (10)	10 (6)	60
(K1761-2)					
208/230V - 60HZ	450/100%	58/53	4 (25)	8 (10)	70/60
460V - 60HZ	450/100%	25	10 (6)	10 (6)	35
575V - 60HZ	450/100%	22	10 (6)	10 (6)	30
200/220V - 50HZ	400/100%	49/45	6 (10)	8 (10)	70/60
440V - 50HZ	400/100%	23	10 (6)	10 (6)	30
208/230V - 60HZ	570/60%	82/78	4 (25)	6 (10)	110/100
460V - 60HZ	570/60%	37	8 (10)	10 (6)	50
575V - 60HZ	570/60%	31	10 (6)	10 (6)	40
200/220V - 50HZ	500/60%	67/61	8 (10)	8 (10)	90/80
440V - 50HZ	500/60%	31	10 (6)	10 (6)	40

Return to Section TOC
Return to Master TOC

TECHNICAL SPECIFICATIONS - POWER WAVE 455/R (K1761-1), (K1761-2) (continued)

PHYSICAL DIMENSIONS			
HEIGHT	**WIDTH**	**DEPTH**	**WEIGHT**
26.10 in 663 mm	19.86 in 505 mm	32.88 in 835 mm	(K1761-1) 247 lbs. 112 kg. (K1761-2) 254 lbs. 115 kg.

TEMPERATURE RANGES	
OPERATING TEMPERATURE RANGE -20°C to +40°C	**STORAGE TEMPERATURE RANGE** -40°C to +40°C

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

SAFETY PRECAUTIONS

Read this entire installation section before you start installation.

⚠ WARNING



ELECTRIC SHOCK can kill.

- Only qualified personnel should perform this installation.
- Turn the input power OFF at the disconnect switch or fuse box before working on this equipment. Turn off the input power to any other equipment connected to the welding system at the disconnect switch or fuse box before working on the equipment.
- Do not touch electrically hot parts.
- Always connect the Power Wave grounding lug (located inside the reconnect input access door) to a proper safety (Earth) ground.

SELECT SUITABLE LOCATION

Do not use Power Waves in outdoor environments. The Power Wave power source should not be subjected to falling water, nor should any parts of it be submerged in water. Doing so may cause improper operation as well as pose a safety hazard. The best practice is to keep the machine in a dry, sheltered area.

Place the welder where clean cooling air can freely circulate in through the rear louvers and out through the case sides and bottom. Dirt, dust, or any foreign material that can be drawn into the welder should be kept at a minimum. Do not use air filters on the air intake, because the air flow will be restricted. Failure to observe these precautions can result in excessive operating temperatures and nuisance shutdowns.

Machines above code 10500 are equipped with F.A.N. (fan as needed) circuitry. The fan runs whenever the output is enabled, whether under loaded or open circuit conditions. The fan also runs for a period of time (approximately 5 minutes) after the output is disabled, to ensure all components are properly cooled.

If desired, the F.A.N. feature can be disabled (causing the fan to run whenever the power source is on). To disable F.A.N., connect leads 444 and X3A together at the output of the solid state fan control relay, located on the back of the Control PC board enclosure. (See the Wiring Diagram.)

⚠ CAUTION

DO NOT MOUNT OVER COMBUSTIBLE SURFACES.
Where there is a combustible surface directly under stationary or fixed electrical equipment, that surface shall be covered with a steel plate at least .06"(1.6mm) thick, which shall extend not less than 5.90"(150mm) beyond the equipment on all sides.

LIFTING

Lift the machine by the lift bail only. The lift bail is designed to lift the power source only. Do not attempt to lift the Power Wave with accessories attached to it.

STACKING

Power Wave machines can be stacked a maximum of three high.

⚠ CAUTION

The bottom machine must always be placed on a firm, secure, level surface. There is a danger of machines toppling over if this precaution is not taken.

MACHINE GROUNDING

The frame of the welder must be grounded. A ground terminal marked with the symbol ⏚ is located inside the reconnect/input access door for this purpose. See your local and national electrical codes for proper grounding methods.

HIGH FREQUENCY PROTECTION

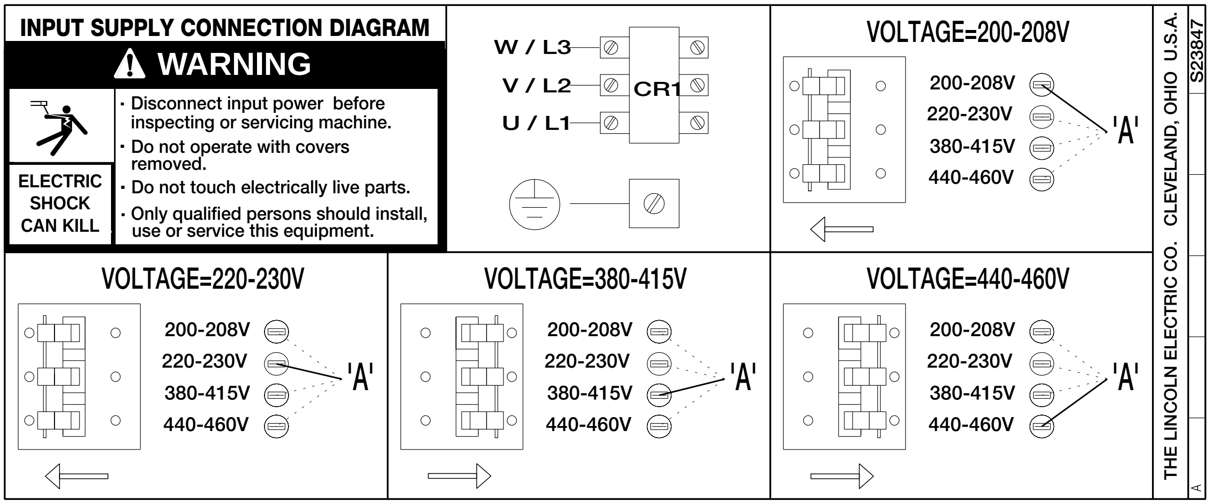
Locate the Power Wave away from radio controlled machinery.

⚠ CAUTION

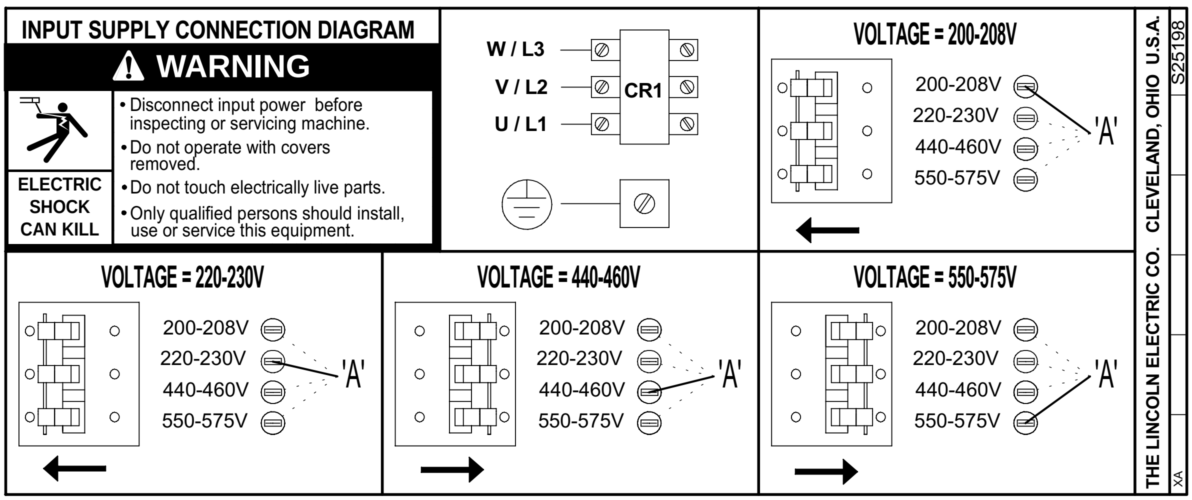
The normal operation of the Power Wave may adversely affect the operation of RF controlled equipment, which may result in bodily injury or damage to the equipment.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

FIGURE A.1
(K1761-1) CONNECTION DIAGRAM ON CONNECTION/INPUT ACCESS DOOR



(K1761-2) CONNECTION DIAGRAM ON CONNECTION/INPUT ACCESS DOOR



NOTE: Turn main input power to the machine OFF before performing connection procedure. Failure to do so will result in damage to the machine.

INPUT CONNECTION

⚠ WARNING

Only a qualified electrician should connect the input leads to the Power Wave. Connections should be made in accordance with all local and national electrical codes and the connection diagram located on the inside of the reconnect/input access door of the machine. Failure to do so may result in bodily injury or death.

Use a three-phase supply line. A 1.75 inch (45 mm) diameter access hole for the input supply is located on the upper left case back next to the input access door. Connect L1, L2, L3 and ground according to the Input Supply Connection Diagram decal located on the inside of the input access door, or refer to Figure A.1.

INPUT FUSE AND SUPPLY WIRE CONSIDERATIONS

Refer to the ***Technical Specifications*** at the beginning of this Installation section for recommended fuse and wire sizes. Fuse the input circuit with the recommended super lag fuse or delay type breakers (also called “inverse time” or “thermal/magnetic” circuit breakers). Choose an input and grounding wire size according to local or national electrical codes. Using fuses or circuit breakers smaller than recommended may result in “nuisance” shut-offs from welder inrush currents, even if the machine is not being used at high currents.

INPUT VOLTAGE CHANGE OVER (FOR MULTIPLE INPUT VOLTAGE MACHINES ONLY)

Welders are shipped connected for the highest input voltage listed on the rating plate. To move this connection to a different input voltage, see the diagram located on the inside of the input access door. ***(Figure A.1.)*** If the main reconnect switch or link position is placed in the wrong position, the welder will not produce output power.

If the Auxiliary **(A)** lead is placed in the wrong position, there are two possible results. If the lead is placed in a position higher than the applied line voltage, the welder may not come on at all. If the auxiliary **(A)** lead is placed in a position lower than the applied line voltage, the welder will not come on, and the two circuit breakers in the reconnect area will open. If this occurs, turn off the input voltage, properly connect the **(A)** lead, reset the breakers, and try again.

WELDING WITH MULTIPLE POWER WAVES

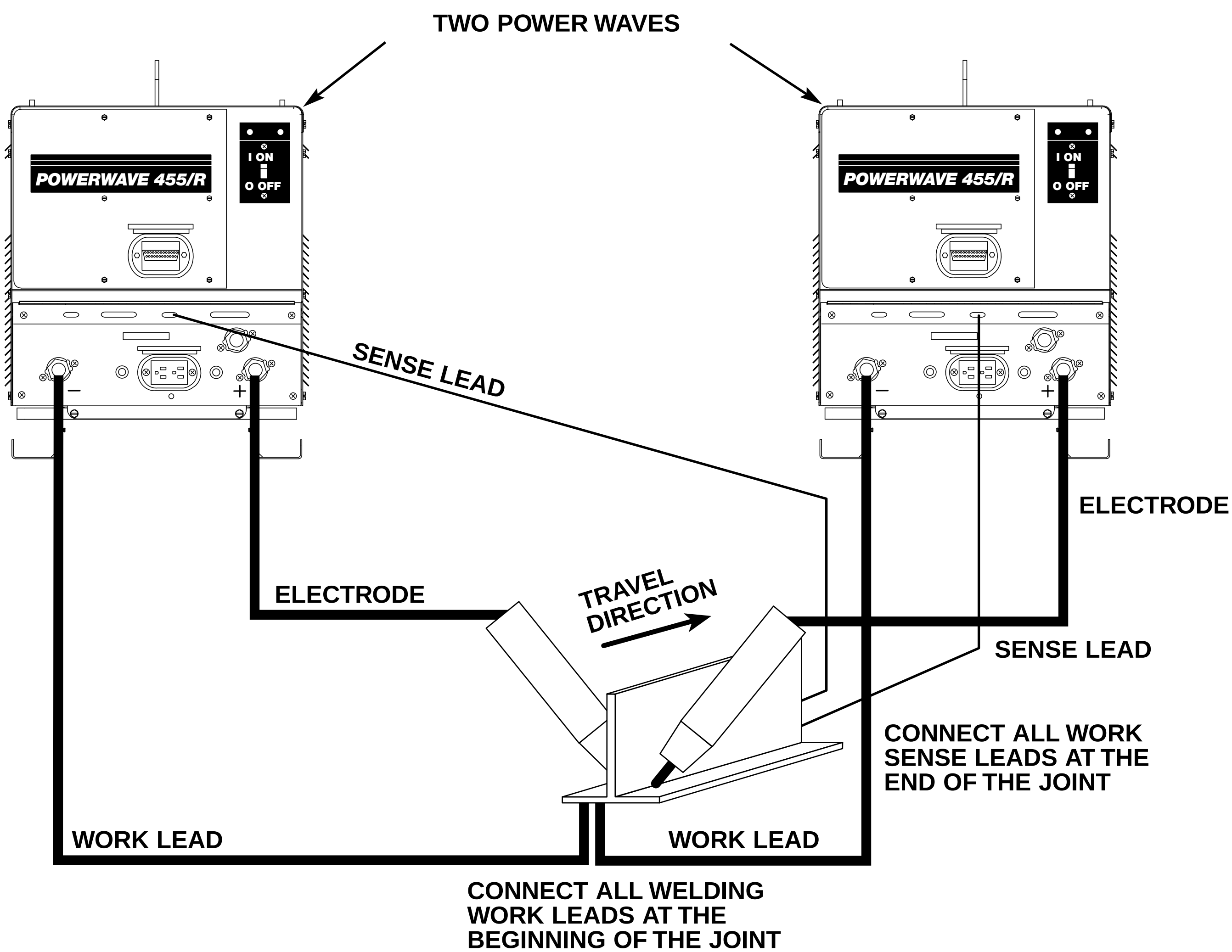
⚠ CAUTION

Special care must be taken when more than one Power Wave is welding simultaneously on a single part. Arc blow and arc interference may occur or be magnified.

Each power source requires a work lead from the work terminal to the welding fixture. Do not combine all of the work leads into one lead. The welding travel directions should be in the direction moving away from the work lead as shown in Figure A.2. Connect all of the work sense leads from each power source to the work piece at the end of the weld.

For the best results when pulse welding, set the wire size and wire feed speed the same for all the Power Waves.

FIGURE A.2 – MULTIPLE POWER WAVE CONNECTIONS



When these parameters are identical, the pulsing frequency will be the same, helping to stabilize the arcs.

Every welding gun requires a separate shielding gas regulator for proper flow rate and shielding gas coverage.

Do not attempt to supply shielding gas for two or more guns from only one regulator.

If an anti-spatter system is in use, each gun must have its own anti-spatter system. See ***Figure A.2.***

ELECTRODE AND WORK CABLE CONNECTIONS

Connect a work lead of sufficient size and length (per Table A.1) between the proper output terminal on the power source and the work. Be sure the connection to the work makes tight metal-to-metal electrical contact. To avoid interference problems with other equipment and to achieve the best possible operation, route all cables directly to the work or wire feeder. Avoid excessive lengths and do not coil excess cable. Do not tightly bundle the electrode and work cables together.

Use K1796 coaxial welding cables wherever possible.

Minimum work and electrode cables sizes are as follows:

TABLE A.1

(Current (60% Duty Cycle)	**MINIMUM COPPER WORK CABLE SIZE AWG** Up To 100 Ft. Length (30 m)
400 Amps	2/0 (67 mm^2)
500 Amps	3/0 (85 mm^2)
600 Amps	3/0 (85 mm^2)

When using an inverter type power source like the Power Wave, use the largest welding (electrode and ground) cables that are practical. At least 2/0 copper wire - even if the average output current would not normally require it.

⚠ CAUTION

When pulsing, the pulse current can reach very high levels. Voltage drops can become excessive, leading to poor welding characteristics, if undersized welding cables are used.

Most welding applications run with the electrode being positive (+). For those applications, connect one end of the electrode cable to the positive (+) output terminal on the power source (located beneath the spring loaded output cover near the bottom of the case front). Connect the other end of the electrode cable to the wire drive feed plate using the stud, lockwasher, and nut provided on the wire drive feed plate. The electrode cable lug must be against the feed plate. Be sure the connection to the feed plate makes tight metal-to-metal electrical contact. The electrode cable should be sized according to the specifications given in Table A.1. Connect a work lead from the negative (-) power source output terminal to the work piece. The work piece connection must be firm and secure, especially if pulse welding is planned.

⚠ CAUTION

Excessive voltage drops caused by poor work piece connections often result in unsatisfactory welding performance.

When welding with the STT process, use the positive output connection labeled (STT) for STT welding. (If desired, other welding modes can be used on this terminal; however, their average output current will be limited to 325 amps.) For non-STT processes, use the positive output connection labeled (Power Wave), so that the full output range of the machine is available.

⚠ CAUTION

Do not connect the STT and Power Wave terminals together. Paralleling the terminals will bypass STT circuitry and severely deteriorate STT welding performance.

NEGATIVE ELECTRODE POLARITY

When negative electrode polarity is required, such as in some Innershield applications, reverse the output connections at the power source (electrode cable to the negative (-) terminal, and work cable to the positive (+) terminal).

When operating with electrode polarity negative, the Dip switch 7 must be set to ON on the Wire Feed Head PC Board. The default setting of the switch is OFF to represent positive electrode polarity.

To set the Negative Polarity switch on Wire Feed Head PC board, refer to the section ***DIP SWITCH SETTINGS AND LOCATIONS.***

Return to Section TOC
Return to Master TOC

VOLTAGE SENSING

The best arc performance occurs when the Power Wave has accurate data about the arc conditions. Depending upon the process, inductance within the electrode and work lead cables can influence the voltage apparent at the terminals of the welder. Voltage sense leads improve the accuracy of the arc conditions and can have a dramatic effect on performance.

⚠ CAUTION

If the voltage sensing is enabled but the sense leads are missing or improperly connected, extremely high welding outputs may occur.

Do not tightly bundle the work sense lead to the work lead.

The sense leads connect to the Power Wave at the four-pin connector located underneath the output terminal cover. Lead 67 senses electrode voltage. Lead 21 senses work voltage.

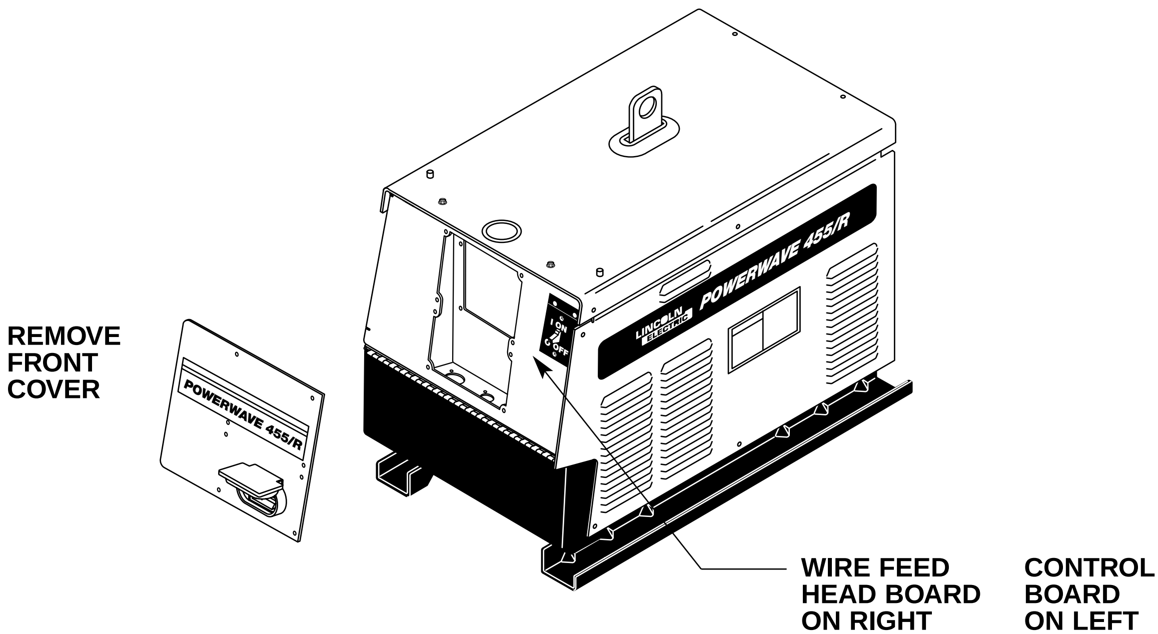
Enable the voltage sense leads as follows:

TABLE A.2

Process	Electrode Voltage Sensing 67 lead *	Work Voltage Sensing 21 lead
GMAW	67 lead required	21 lead optional
GMAW-P	67 lead required	21 lead optional
FCAW	67 lead required	21 lead optional
STT	67 lead required	21 lead required
GTAW	Voltage sense at terminals	Voltage sense at terminals
SAW	67 lead required	21 lead optional

* The electrode voltage 67 sense lead is integral to the control cable to the wire feeder.

FIGURE A.3 – DIP SWITCH LOCATION



Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

WORK VOLTAGE SENSING

The Power Wave is shipped from the factory with the work sense lead enabled.

For processes requiring work voltage sensing, connect the (21) work voltage sense lead from the Power Wave to the work. Attach the sense lead to the work as close to the weld as practical. To enable the work voltage sensing in the Power Wave, refer to the section ***DIP SWITCH SETTINGS AND LOCATIONS.***

ELECTRODE VOLTAGE SENSING

Enabling or disabling electrode voltage sensing is automatically configured through software. Electrode sense lead 67 must be connected at the wire feeder.

POWER WAVE / POWER FEED WIRE FEEDER INTERCONNECTIONS

Connect the control cable between the power source and wire feeder. The wire feeder connection on the robotic Power Wave is located under the spring loaded output cover, near the bottom of the case front. The control cable is keyed and polarized to prevent improper connection.

For convenience sake, the electrode and control cables can be routed behind the left or right strain reliefs (under the spring loaded output cover), and along the channels formed into the base of the Power Wave, out the back of the channels, and then to the wire feeder.

Output connections on some Power Waves are made via 1/2-13 threaded output terminals located beneath the spring-loaded output cover at the bottom of the case front. On machines which carry the CE mark, output connections are made via Twist-Mate receptacles, also located beneath the spring-loaded output cover at the bottom of the case front.

A work lead must be run from the negative (-) power source output connection to the work piece. The work piece connection must be firm and secure, especially if pulse welding is planned.

⚠ CAUTION

Excessive voltage drops at the work piece connection often result in unsatisfactory pulse welding performance.

CONTROL CABLE SPECIFICATIONS

It is recommended that genuine Lincoln control cables be used at all times. Lincoln cables are specifically designed for the communication and power needs of the Power Wave / Power Feed system.

⚠ CAUTION

The use of non-standard cables, especially in lengths greater than 25 feet, can lead to communication problems (system shutdowns), poor motor acceleration (poor arc starting) and low wire driving force (wire feeding problems).

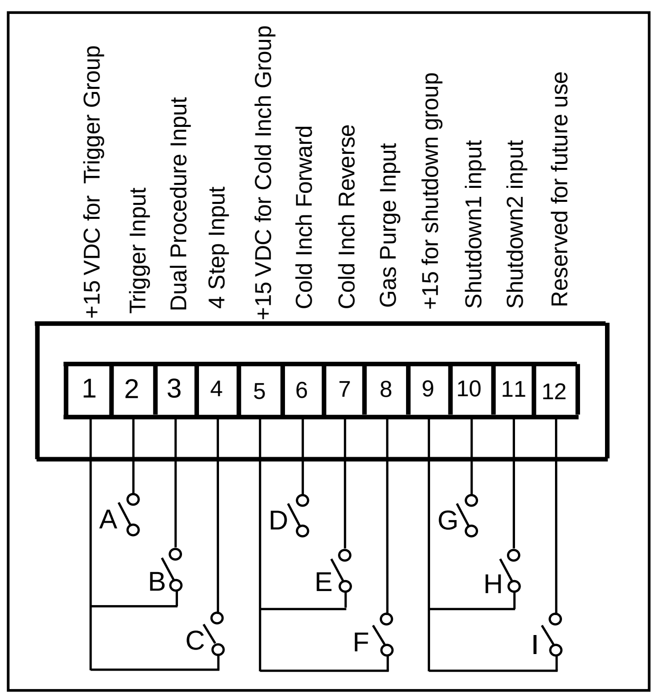
Lincoln control cables are copper 22 conductor cable in a SO-type rubber jacket.

EXTERNAL I/O CONNECTOR

The Power Wave is equipped with a port for making simple input signal connections. The port is divided into three groups: Trigger group, Cold Inch Group and Shutdown Group. Because the Power Wave is a “slave” on the DeviceNet network, the Trigger and Cold Inch Groups are disabled when the DeviceNet/Gateway is active.

The Shutdown Group is always enabled. Shutdown 2 is used for signaling low flow in the water cooler. Unused shutdowns must be jumpered. Machines from the factory come with the shutdowns already jumpered. (See Figure A.4)

FIGURE A.4 – INPUT PORT CONNECTIONS



LINCOLN ELECTRIC

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

DIP SWITCH SETTINGS AND LOCATIONS

DIP switches on the PC boards allow for custom configuration of the Power Wave. Access the DIP switches as follows:

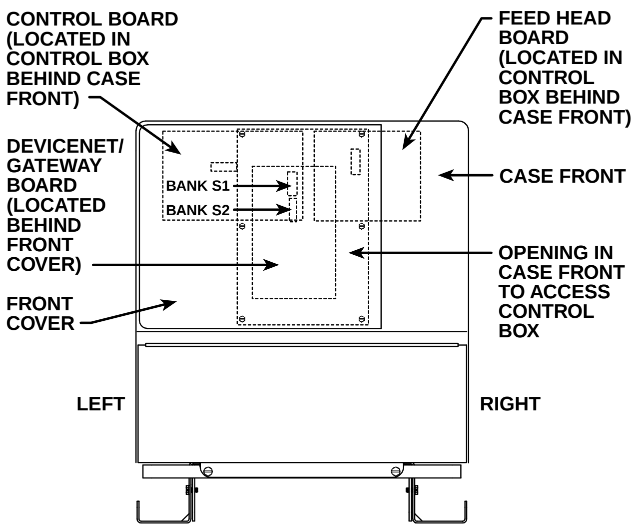
⚠ WARNING



ELECTRIC SHOCK CAN KILL.

- Do not touch electrically live parts or electrodes with your skin or wet clothing.
- Insulate yourself from the work and ground.
- Always wear dry insulating gloves.

- Turn off power at the disconnect switch.
- Remove the top four screws securing the front access panel.
- Loosen, but do not completely remove, the bottom two screws holding the access panel.
- Open the access panel, allowing the weight of the panel to be carried by the bottom two screws. Make sure to prevent the weight of the access panel from hanging on the harness.
- Adjust the DIP switches as necessary. Using a pencil or other small object, slide the switch left for the ON position or to the right for the OFF position, as appropriate.
- Replace the panel and screws and restore power.



CONTROL BOARD DIP SWITCH:

switch 1 = reserved for future use
switch 2 = reserved for future use
switch 3 = reserved for future use
switch 4 = reserved for future use
switch 5 = reserved for future use
switch 6 = reserved for future use
switch 7 = reserved for future use
switch 8 = work sense lead

switch 8	work sense lead
off	work sense lead not connected
on	work sense lead connected

FEED HEAD BOARD DIP SWITCH:

switch 1 = reserved for future use
switch 2 = reserved for future use
switch 3 = reserved for future use
switch 4 = reserved for future use
switch 5 = reserved for future use
switch 6 = reserved for future use
switch 7 = negative polarity switch
switch 8 = high speed gear

switch 7	electrode polarity
off	positive
on	negative

switch 8	wire drive gear
off	low speed gear
on	high speed gear

Return to Section TOC
Return to Master TOC

DEVICENET/GATEWAY BOARD DIP SWITCH, BANK (S2):

switch 1,2 = configure the baud rate for DeviceNET

Prior to S24958-6 software		
switch 1	**switch 2**	**baud rate**
off	off	-------
on	off	125K
off	on	250K
on	on	500

S24958-6 and later software		
switch 1	**switch 2**	**baud rate**
off	off	125K
off	on	250K
on	off	500K
on	on	500K
Programmable value. Consult local Lincoln Technical representative.		

switch 5 = reserved for future use
switch 6 = reserved for future use
switch 7 = reserved for future use
switch 8 = reserved for future use

Return to Master TOC
Return to Master TOC
Return to Master TOC
Return to Master TOC

TABLE OF CONTENTS
- OPERATION SECTION -

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

SAFETY PRECAUTIONS

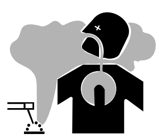
Read this entire section of operating instructions before operating the machine.

⚠ WARNING



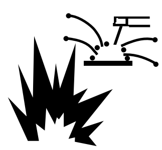
ELECTRIC SHOCK can kill.

- Unless using cold feed feature, when feeding with gun trigger, the electrode and drive mechanism are always electrically energized and could remain energized several seconds after the welding ceases.
- Do not touch electrically live parts or electrodes with your skin or wet clothing.
- Insulate yourself from the work and ground.
- Always wear dry insulating gloves.



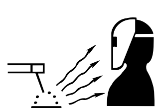
FUMES AND GASES can be dangerous.

- Keep your head out of fumes.
- Use ventilation or exhaust to remove fumes from breathing zone.



WELDING SPARKS can cause fire or explosion.

- Keep flammable material away.
- Do not weld on containers that have held combustibles.



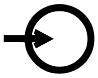
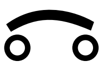
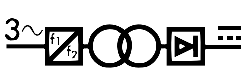
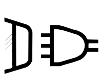
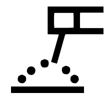
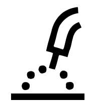
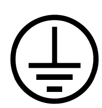
ARC RAYS can burn.

- Wear eye, ear, and body protection.

Observe additional guidelines detailed in the beginning of this manual.

Return to Section TOC
Return to Master TOC

GRAPHIC SYMBOLS THAT APPEAR ON THIS MACHINE OR IN THIS MANUAL

Symbol	Meaning
	INPUT POWER
|	ON
O	OFF
	HIGH TEMPERATURE
	MACHINE STATUS
	CIRCUIT BREAKER
	WIRE FEEDER
+	POSITIVE OUTPUT
—	NEGATIVE OUTPUT
	3 PHASE INVERTER
	INPUT POWER
3 ~	THREE PHASE
⎓	DIRECT CURRENT
	SMAW
	GMAW
	FCAW
	GTAW
U_0	OPEN CIRCUIT VOLT-AGE
U_1	INPUT VOLTAGE
U_2	OUTPUT VOLTAGE
I_1	INPUT CURRENT
I_2	OUTPUT CURRENT
	PROTECTIVE GROUND
	WARNING OR CAUTION

Return to Section TOC
Return to Master TOC

GENERAL DESCRIPTION

The Power Wave power source is designed to be a part of a modular, multi-process welding system. Depending on configuration, it can support constant current, constant voltage, Surface Tension Transfer and pulse welding modes.

The Power Wave power source is designed to be used with the family of Power Feed wire feeders, operating as a system. Each component in the system has special circuitry to “talk with” the other system components, so each component (power source, wire feeder, electrical accessories) knows what the other is doing at all times. The components communicate using ArcLink protocol.

Robotic systems can communicate with other industrial machines via DeviceNET protocol. The result is a highly intrigated and flexible welding cell.

The Power Wave 455/R is a high performance, digitally controlled inverter welding power source capable of complex, high-speed waveform control. Properly equipped, it can support the GMAW, GMAW-P, FCAW, GTAW and STT processes. It carries an output rating of either 450 amps, 38 volts; or 400 amps, 36 volts (both at 100% duty cycle), depending on input voltage and frequency. The Surface Tension transfer process (STT) is supported at currents up to 325 amps, at 100% duty cycle.

If the duty cycle is exceeded, a thermostat will shut off the output until the machine cools to a reasonable operating temperature.

DESIGN FEATURES AND ADVANTAGES

- Designed to the IEC 974-1 Standard.
- Power Wave 455 multiple process output ranges: 5 - 570 amps
- Easy access for input connections. Connections are simple strip and clamp (no lugs required).
- F.A.N. (Fan As Needed). Cooling fan runs only when necessary (above Code 10500 only, and all STT machines).
- Modular construction for easy servicing.
- Thermostatically protected.
- Electronic over-current protection.
- Input over-voltage protection.
- Utilizes digital signal processing and microprocessor control.
- Simple, reliable input voltage change over.
- All system components communicate and transfer information.
- Auto device recognition simplifies accessory cable connections.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

RECOMMENDED PROCESSES AND EQUIPMENT

RECOMMENDED PROCESSES

The Power Wave 455/R can be set up in a number of configurations, some requiring optional equipment or welding programs. Each machine is factory preprogrammed with multiple welding procedures, typically including GMAW, GMAW-P, FCAW, GTAW and STT for a variety of materials, including mild steel, stainless steel, cored wires, and aluminum. The STT process supports mild steel and stainless steel welding.

The Power Wave 455/R is recommended only for automatic or mechanized applications such as robotic welding.

RECOMMENDED EQUIPMENT

Automatic Operation

All welding programs and procedures are set through software for the robotic Power Wave. FANUC robots equipped with RJ-3 controllers may communicate directly with the Power Wave. Other pieces of equipment such as PLCs or computers can communicate with the Power Wave using DeviceNET. All wire welding processes require a robotic Power Feed wire feeder.

REQUIRED EQUIPMENT

- PF-10/R Wire Feeder, K1780-1
- Control Cables (22 pin to 22 pin), K1795-10,-25,-50,-100
- Control Cables (for use on FANUC robot arm, 22 pin to 14 pin, 10 ft), K1804-1
- Control Cables (for use on FANUC robot arm, 22 pin to 14 pin, 18 in), K1805-1
- Control Cables (for use on FANUC robot arm, 22 pin to 14 pin, 18 in), K1804-2

LIMITATIONS

- The Power Wave 455/R is not suitable for SMAW, CAC-A or other processes not listed.
- Power Waves are not to be used in outdoor environments.
- Only ArcLink Power Feed wire feeders and user interfaces may be used. Other Lincoln wire feeders or non-Lincoln wire feeders cannot be used.

DUTY CYCLE AND TIME PERIOD

The Power Feed wire feeders are capable of welding at a 100% duty cycle (continuous welding). The power source will be the limiting factor in determining system duty cycle capability. Note that the duty cycle is based upon a ten minute period. A 60% duty cycle represents 6 minutes of welding and 4 minutes of idling in a ten minute period.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

CASE FRONT CONTROLS

All operator controls and adjustments are located on the case front of the Power Wave. (See Figure B.1)

1. POWER SWITCH: Controls input power to the Power Wave.

2. STATUS LIGHT: A two color light that indicates system errors. Normal operation is a steady green light. Error conditions are indicated, per Table B.1.

NOTE: The robotic Power Waves' status light will flash green, and sometimes red and green, for up to one minute when the machine is first turned on. This is a normal situation as the machine goes through a self test at power up.

TABLE B.1

Light Condition	Meaning
Steady Green	System OK. Power source communicating normally with wire feeder and its components.
Blinking Green	Normal for first 1-10 seconds after power is turned on.
Alternating Green and Red	Non-recoverable system fault. Must turn power source off, find source of error, and turn power back on to reset. See ***Troubleshooting Guide.***
Steady Red	See ***Troubleshooting Guide.***

3. HIGH TEMPERATURE LIGHT (thermal overload): A yellow light that comes on when an over temperature situation occurs. Output is disabled until the machine cools down. When cool, the light goes out and output is enabled.

4. 10 AMP WIRE FEEDER CIRCUIT BREAKER: Protects 40 volt DC wire feeder power supply.

5. 10 AMP AUXILIARY POWER CIRCUIT BREAKER: Protects 115 volt AC case front receptacle auxiliary supply.

6. LEAD CONNECTOR S2 (SENSE LEAD)

7. 5-PIN ARC LINK S1

8. 5-PIN DEVICENET CONNECTOR S5

9. I / O CONNECTOR

10. NEGATIVE OUTPUT TERMINAL

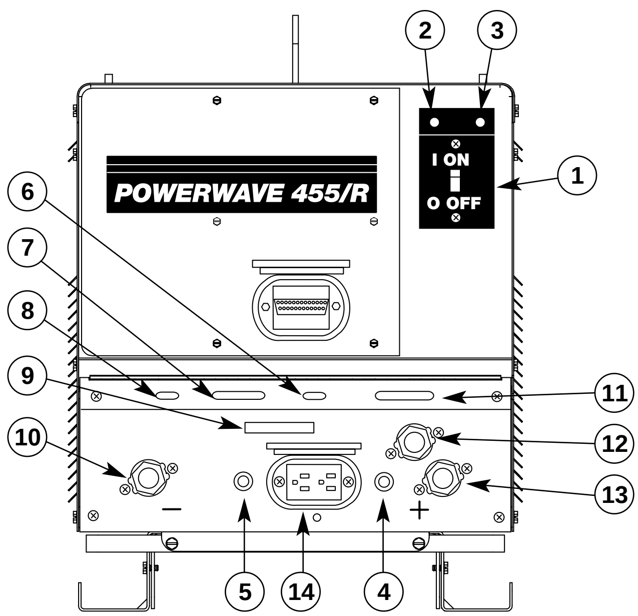
11. INTERFACE CONNECTOR S6

12. STT TERMINAL

13. POSITIVE OUTPUT TERMINAL

14. AUXILIARY OUTPUT

FIGURE B.1 – POWER WAVE CASE FRONT CONTROLS



Return to Section TOC
Return to Master TOC

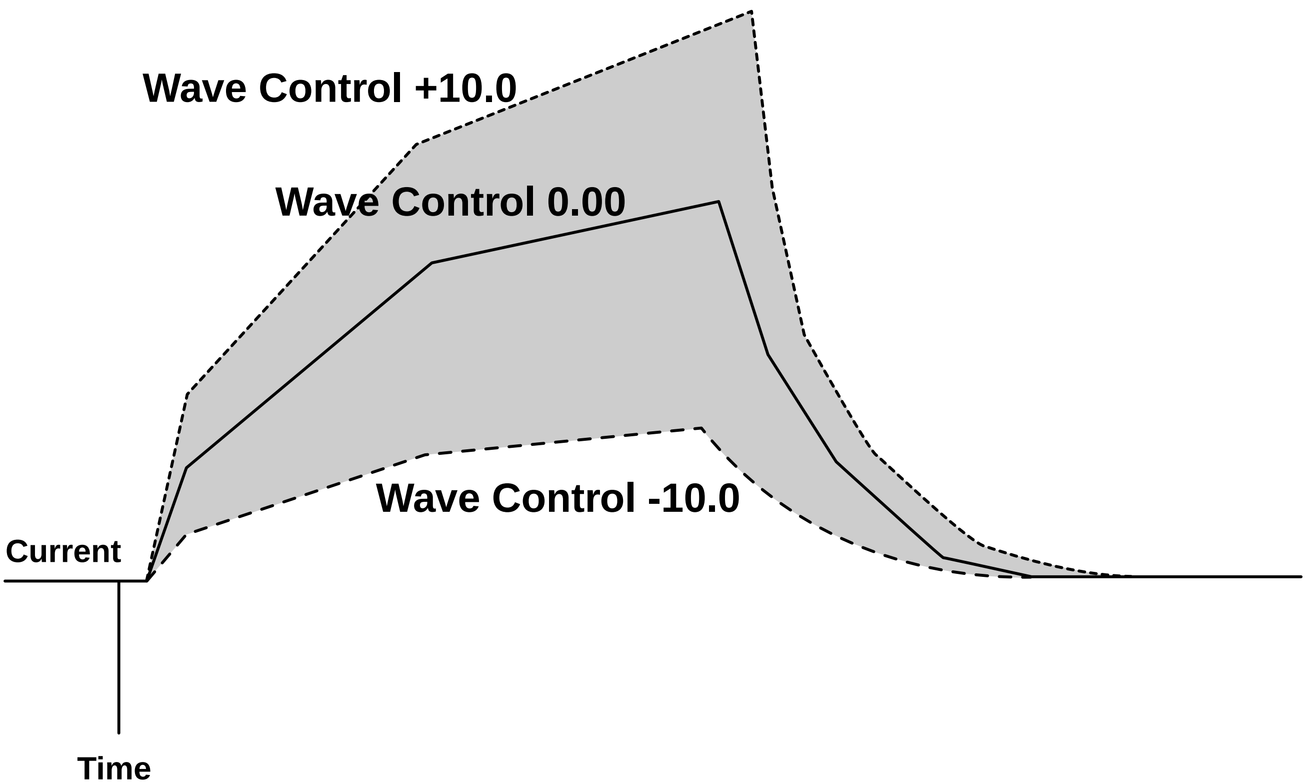
WELDING MODE DESCRIPTIONS

CONSTANT VOLTAGE WELDING

For each wire feed speed, a corresponding voltage is preprogrammed into the machine through special software at the factory. The preprogrammed voltage is the best average voltage for a given wire feed speed. With synergic programs, when the wire feed speed changes, the Power Wave will automatically adjust the corresponding voltage.

Wave control adjusts the inductance of the waveshape. (This adjustment is often referred to as "pinch". Inductance is inversely proportional to pinch.) Increasing wave control greater than 0 results in a harsher, colder arc, while decreasing the wave control to less than 0 provides a softer, hotter arc. (See Figure B.2.)

FIGURE B.2 – CV WAVE CONTROL CHARACTERISTICS



PULSE WELDING

Pulse welding procedures are set by controlling an overall "arc length" variable. When pulse welding, the arc voltage is highly dependent upon the waveform. The peak current, background current, rise time, fall time and pulse frequency all affect the voltage. The exact voltage for a given wire feed speed can only be predicted when all the pulsing waveform parameters are known. Using a preset voltage becomes impractical, and instead the arc length is set by adjusting "trim."

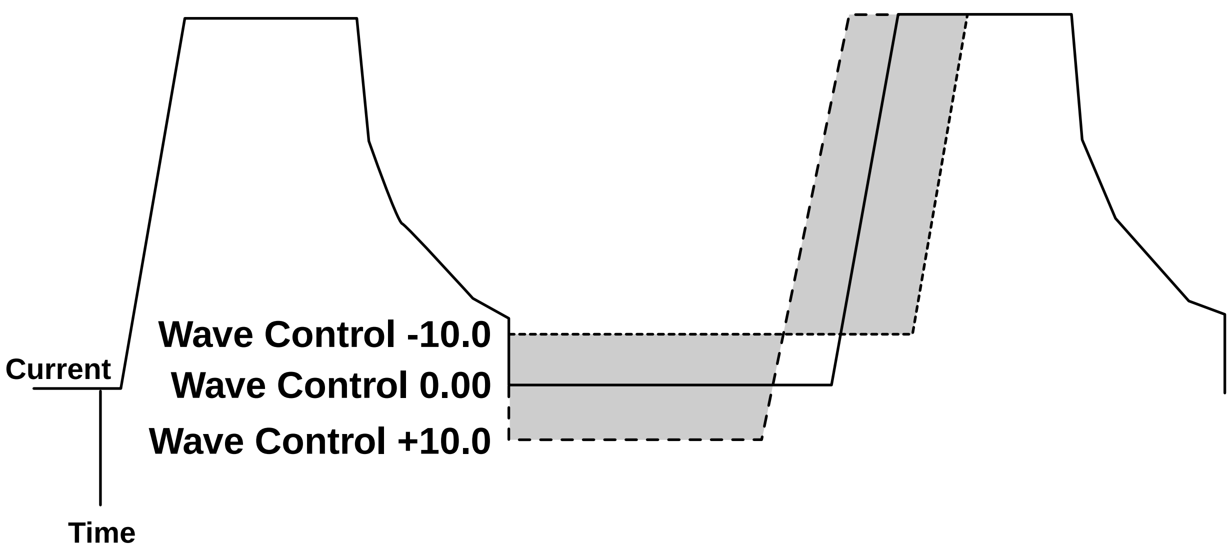
Trim adjusts the arc length and ranges from 0.50 to 1.50, with a nominal value of 1.00. Trim values greater than 1.00 increase the arc length, while values less than 1.00 decrease the arc length.

Most pulse welding programs are synergic. As the wire feed speed is adjusted, the Power Wave will automatically recalculate the waveform parameters to maintain similar arc properties.

The Power Wave utilizes "adaptive control" to compensate for changes in electrical stick-out while welding. (Electrical stick-out is the distance from the contact tip to the work piece.) The Power Wave waveforms are optimized for a 0.75" (19mm) stick-out. The adaptive behavior supports a range of stickouts from 0.50" (13mm) to 1.25" (32mm). At very low or high wire feed speeds, the adaptive range may be less due to reaching the physical limitations of the welding process.

Wave control in pulse programs usually adjusts the focus or shape of the arc. Wave control values greater than 0 increase the pulse frequency while decreasing the background current, resulting in a tight, stiff arc best for high speed sheet metal welding. Wave control values less than 0 decrease the pulse frequency while increasing the background current for a soft arc good for out-of-position welding. (See Figure B.3.)

FIGURE B.3 – PULSE WAVE CONTROL CHARACTERISTICS

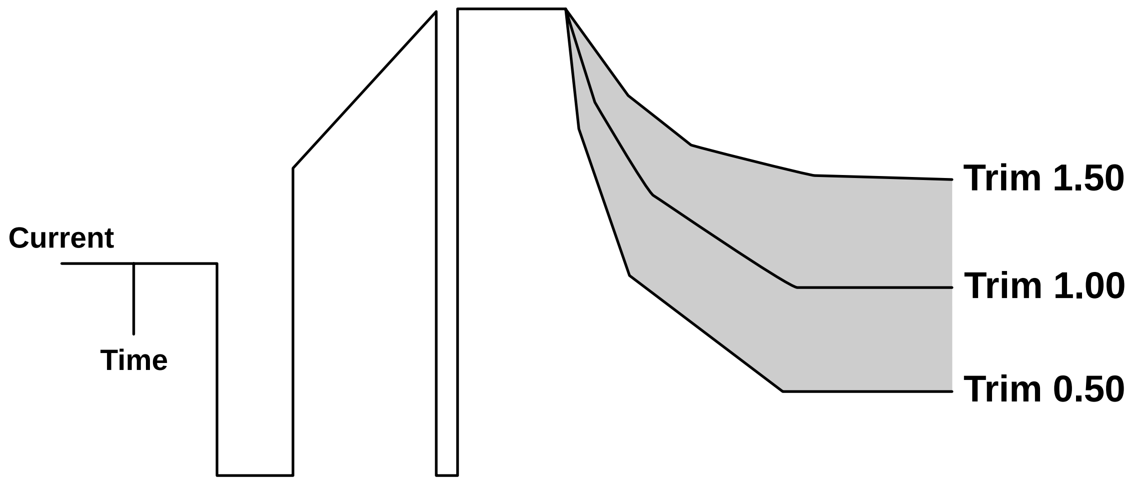


STT WELDING

The pictures illustrate the waveshape of current for the process. They are not drawn to scale, and are intended only for the purpose of showing how the variables affect the waveform.

Trim in the STT mode adjusts the tailout and background portion of the waveform. Trim values greater than 1.0 add more energy to the weld and make the weld puddle hotter; trim values less than 1.0 reduce energy to weld. A nominal value of 1.0 will work for most applications. (See Figure B.4.)

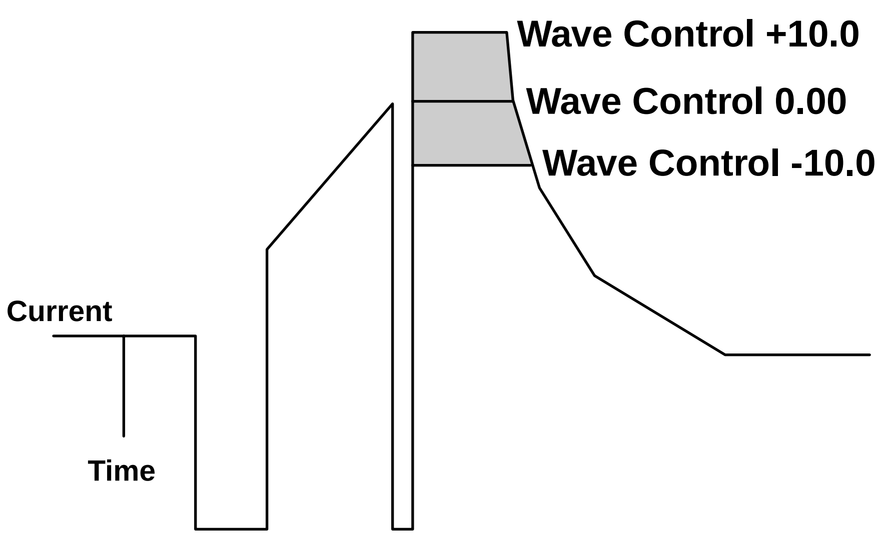
FIGURE B.4 – STT TRIM CONTROL CHARACTERISTICS



For most programs, peak current is adjusted by wave control values. A value of +10.0 maximizes the peak current, while a wave control of -10.0 minimizes peak current. In general, the peak current is proportional to torch arc length. (See Figure B.5.)

NOTE: The ranges on Wave Control and Trim are dependent on the weld programs. The values shown are typical ranges.

FIGURE B.5 – STT WAVE CONTROL CHARACTERISTICS



NOTES

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

TABLE OF CONTENTS
- ACCESSORIES SECTION -

Return to Master TOC
Return to Master TOC
Return to Master TOC
Return to Master TOC

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

OPTIONAL EQUIPMENT

FACTORY INSTALLED

There are no factory installed options available for the Power Wave 455R.

FIELD INSTALLED

- **Gas Guard Regulator (K659-1)**
  The Gas Guard regulator is available as an optional accessory for the Power Feed Robotic wire drive unit. Install the 5/8-18 male outlet on the regulator to the proper 5/8-18 female gas inlet on the back panel of the wire drive. Secure the fitting with the flow adjuster key at the top.

- **Voltage Sense Leads (K940-10, -25 or -50)**
  The voltage sense leads connect at the front of the machine. (See ***Figure A.2.)***

- **Power Wave Water Cooler (K1767-1)***
  The K1767-1 is the recommended water cooler for the Power Wave. Incorporated into the cooler is an automatic flow sensor to detect low coolant flow. In the event of a low flow condition, a fault signal is sent to the Power Wave, and welding output automatically stops to protect the torch.

  The water cooler is designed to cool only one welding gun and should be not used to cool multiple guns or other devices.

  Water cooler manufacturers often specify additives to the coolant such as fungicides or alkalies. Follow the manufacturers' recommendations to achieve proper operation and long lifetime without clogging.

- **Water Flow Sensor (K1536-1)**
  Water cooled guns can be damaged very quickly if they are used even momentarily without water flowing. Recommend practice is to install a water flow sensor such as on the water return line of the torch. When fully integrated into the welding system, the sensor will prevent welding if no water flow is present.

- **Dual Cylinder Undercarriage, K1570-1***

- **Coaxial Welding Cable, K1796**

*The Dual Cylinder Undercarriage, K1570-1, is not compatible in combination with the Power Wave Water Cooler K1767-1.

TABLE OF CONTENTS
- MAINTENANCE SECTION -

Return to Master TOC
Return to Master TOC
Return to Master TOC
Return to Master TOC

SAFETY PRECAUTIONS

⚠ WARNING

ELECTRIC SHOCK can kill.



- Only Qualified personnel should perform this maintenance.
- Turn the input power OFF at the disconnect switch or fuse box before working on this equipment.
- Do not touch electrically hot parts.

ROUTINE AND PERIODIC MAINTENANCE

1. Disconnect input AC power supply lines to the machine before performing periodic maintenance, tightening, cleaning, or replacing parts. See ***Figure D.1.***

PERFORM THE FOLLOWING DAILY:

1. Check that no combustible materials are in the welding or cutting area or around the machine.
2. Remove any debris, dust, dirt, or materials that could block the air flow to the machine for cooling.
3. Inspect the electrode cables for any slits or punctures in the cable jacket, or any condition that would affect the proper operation of the machine.

PERFORM PERIODICALLY:

Clean the inside of the machine with a low pressure air stream. Clean the following parts. Refer to ***Figure D.1.***

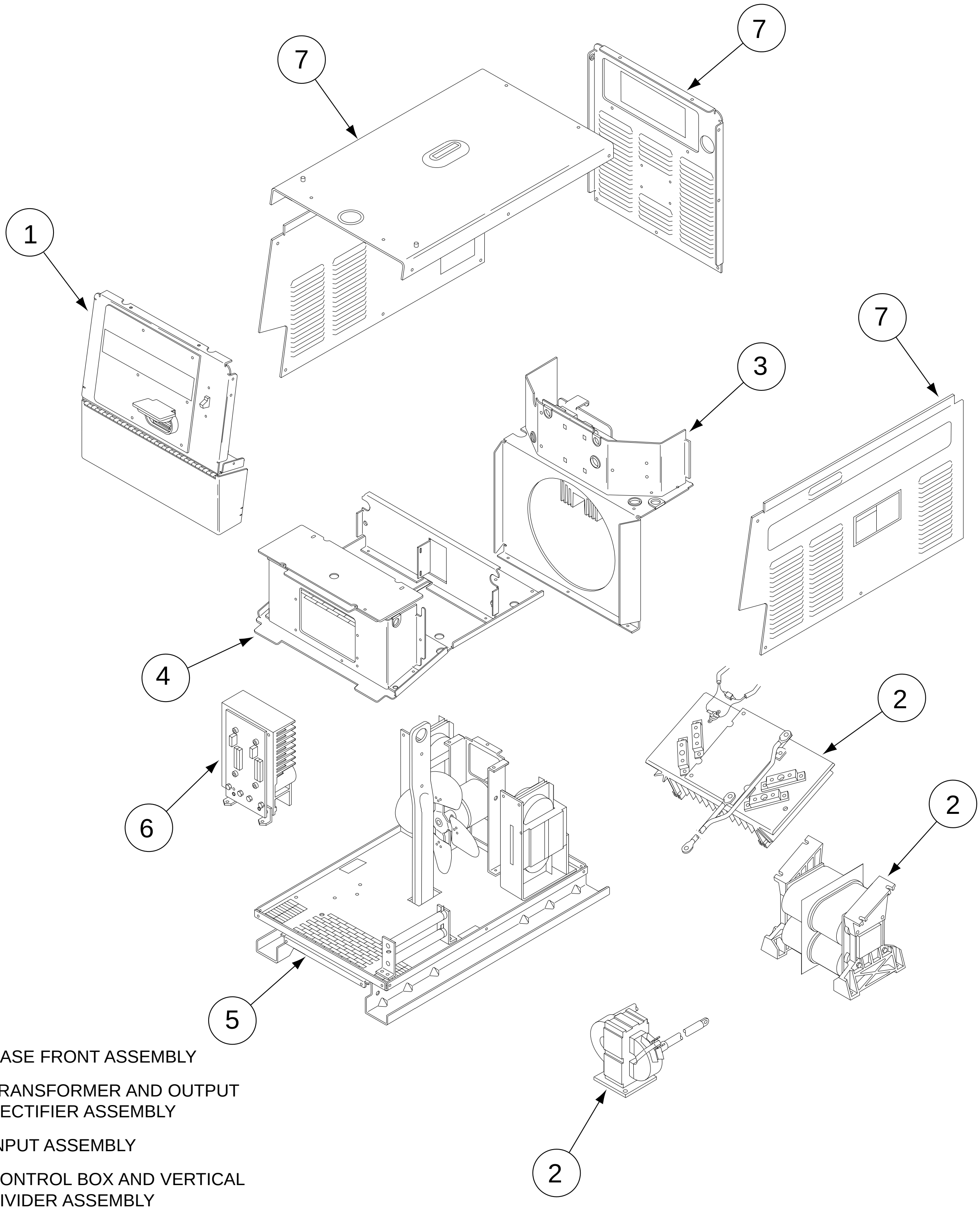
- Transformer and output rectifier assembly.
- Electrode and work cable connections.
- PC board connections..
- Intake and outlet louvers on the machine case.
- Any obvious accumulations of dirt within the machine.
- Fan Assembly.

NOTE: The fan motor has sealed bearings which require no maintenance.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

FIGURE D.1 – MAIN ASSEMBLY (EXPLODED VIEW)



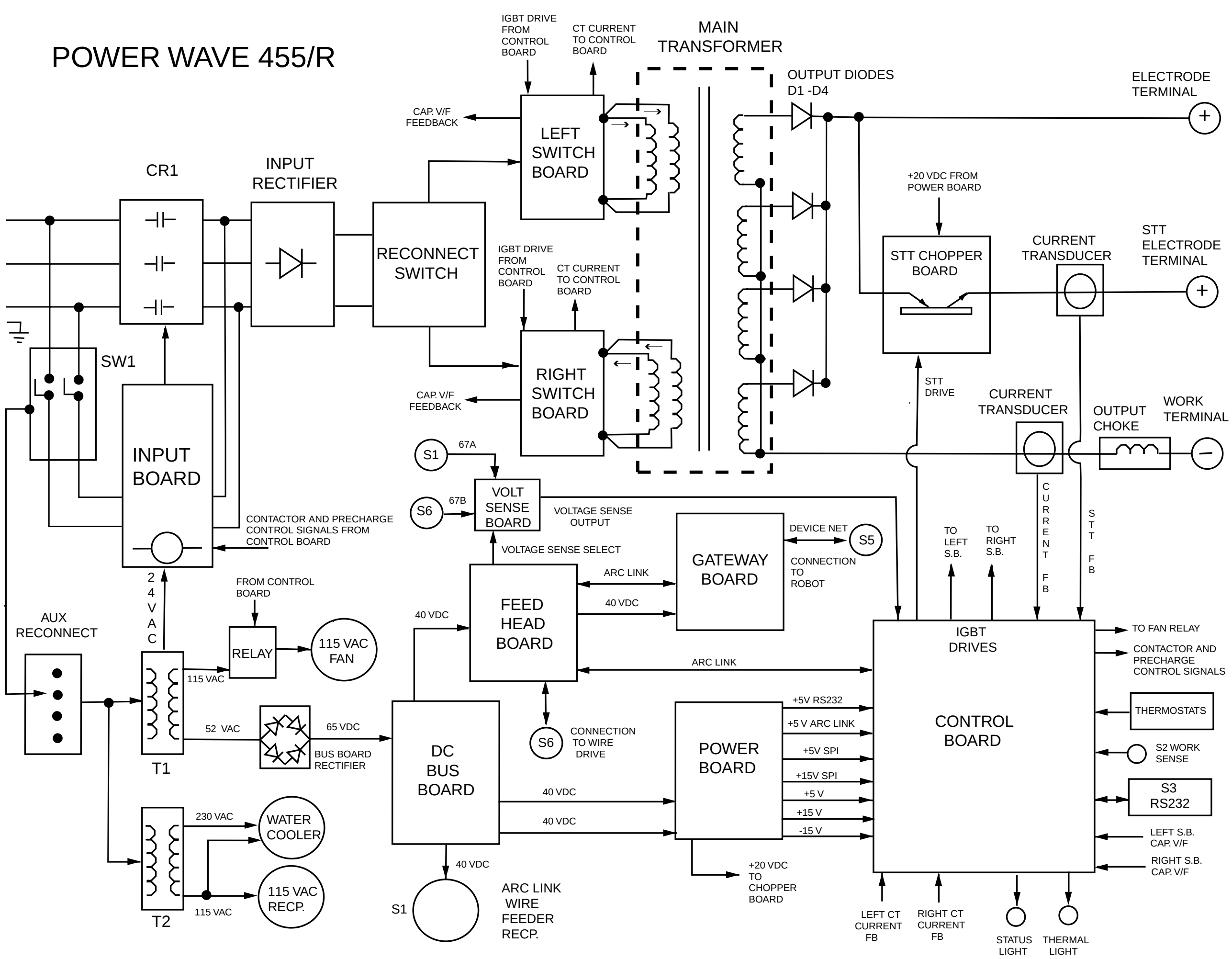
1. CASE FRONT ASSEMBLY
2. TRANSFORMER AND OUTPUT RECTIFIER ASSEMBLY
3. INPUT ASSEMBLY
4. CONTROL BOX AND VERTICAL DIVIDER ASSEMBLY
5. BASE, LIFT BAIL AND FAN ASSEMBLY
6. SWITCH BOARD HEATSINK ASSEMBLY
7. CASE PARTS

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

Return to Master TOC
Return to Master TOC
Return to Master TOC
Return to Master TOC

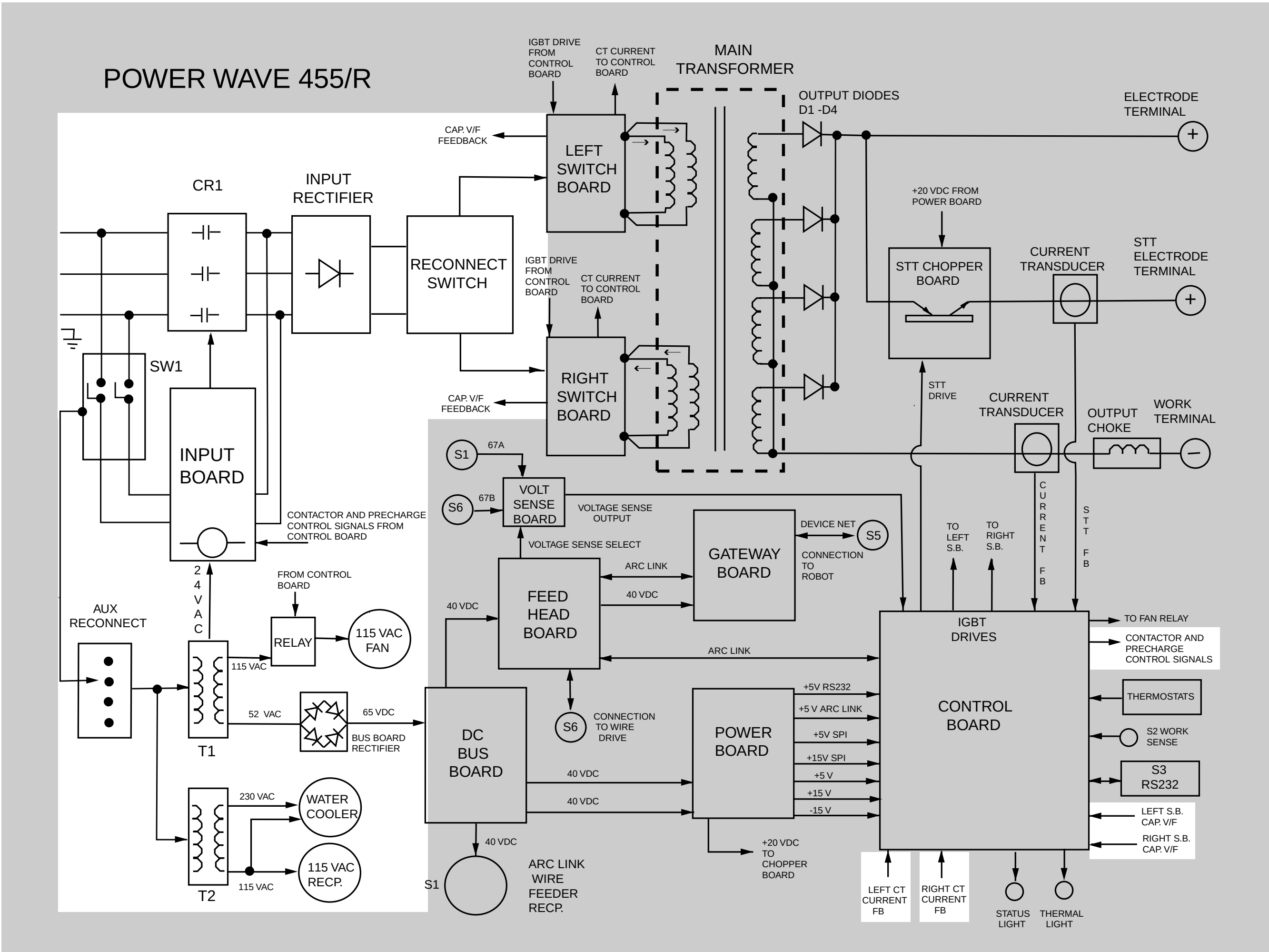
TABLE OF CONTENTS
- THEORY OF OPERATION SECTION -

FIGURE E.1 – BLOCK LOGIC DIAGRAM



Return to Section TOC
Return to Master TOC

FIGURE E.2 – INPUT VOLTAGE AND PRECHARGE



GENERAL DESCRIPTION

The Power Wave 455/R power source is designed to be a part of a modular, multi-process welding system. It is a high performance, digitally controlled inverter welding power source capable of complex, high-speed waveform control. Depending upon configuration, it can support constant current, constant voltage, surface tension transfer and pulse welding modes. Each machine is factory preprogrammed with multiple welding procedures. Typically these procedures include GMAW, GMAW-P, FCAW, GTAW and STT (Surface Tension Transfer) for a variety of materials such as mild steel, stainless steel, cored wires and aluminum. The STT process supports mild steel and stainless steel welding.

The Power Wave 455/R has an output rating of either 450 amps at 38 volts or 400 amps at 36 volts. The two output ratings are dependent upon input voltage and frequency. Both have a duty cycle of 100%. The STT process is rated at currents up to 325 amps at a 100% duty cycle.

NOTE: Unshaded areas of Block Logic Diagram are the subject of discussion.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

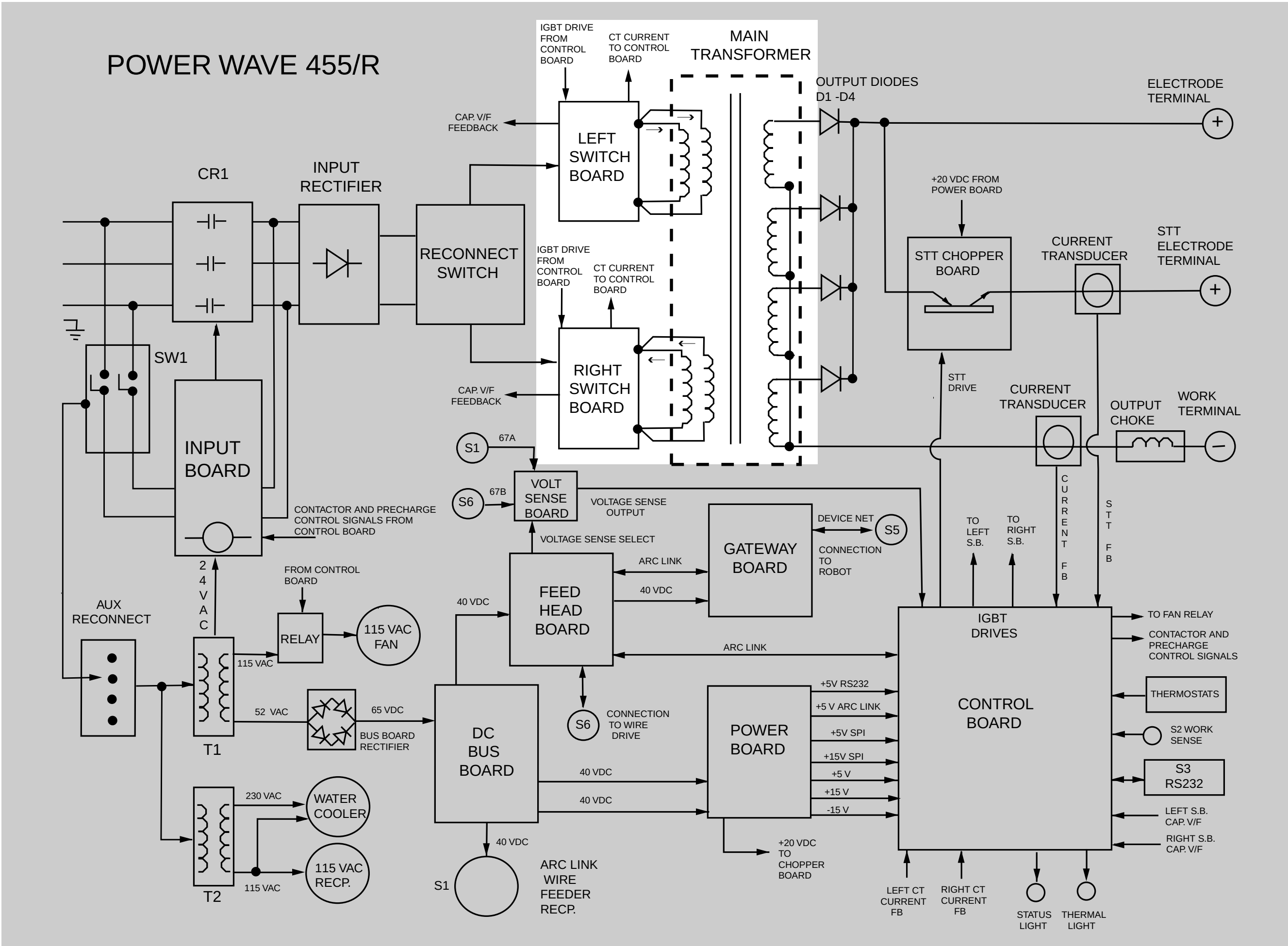
INPUT VOLTAGE AND PRECHARGE

The Power Wave 455/R can be connected for a variety of three-phase input voltages. Refer to Figure E.2. The initial input power is applied to the Power Wave 455/R through a line switch located on the front of the machine. Two phases of the three-phase input power are applied to the Input Board and both auxiliary transformers. The various secondary voltages developed by transformer T1 are applied to the Input Board, the fan motor (via a control relay) and the Bus Board rectifier. The 65VDC produced from the Bus Board rectifier is used by the Bus Board to provide various DC voltages for the Power Board, the Feed Head Board and the wire feeder receptacle. The 115/230VAC developed on the secondary of auxiliary transformer T2 is applied to the 115VAC receptacle and to the water cooler receptacle.

The two phases that are connected to the Input Board, through the input line switch SW1, are connected to the input rectifier through the CR1 precharge relay. During the precharge or "soft start" sequence, these two phases are current limited by the Input Board. The AC input voltage is rectified, and the resultant DC voltage is applied through the reconnect switches to the input capacitors located on the right and left switch boards. The Control Board monitors the voltage across the capacitors. When the capacitors have charged to an acceptable level, the Control Board signals the Input Board to energize the main input contactor, making all three phases of input power, without current limiting, available to the input capacitors. At this point the Power Wave 455/R is in the "Run Mode" of operation. If the capacitors become undervoltaged, overvoltaged, or unbalanced, the Control Board will signal the Input Board to de-energize the main input contactor, and the Power Wave 455/R will be disabled. See ***Figure E.2.***

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

FIGURE E.3 - SWITCH BOARDS AND MAIN TRANSFORMER



SWITCH BOARDS AND MAIN TRANSFORMER

There are two switch boards in the Power Wave 455/R machine. Each contains an input capacitor and insulated gate bipolar transistor (IGBT) switching circuitry. Refer to Figure E.3. When the machine reconnect switches are configured for a lower input voltage (below 300VAC), the input capacitors are connected in parallel. When the machine is configured for higher input voltages (300VAC and above), the input capacitors are connected in series.

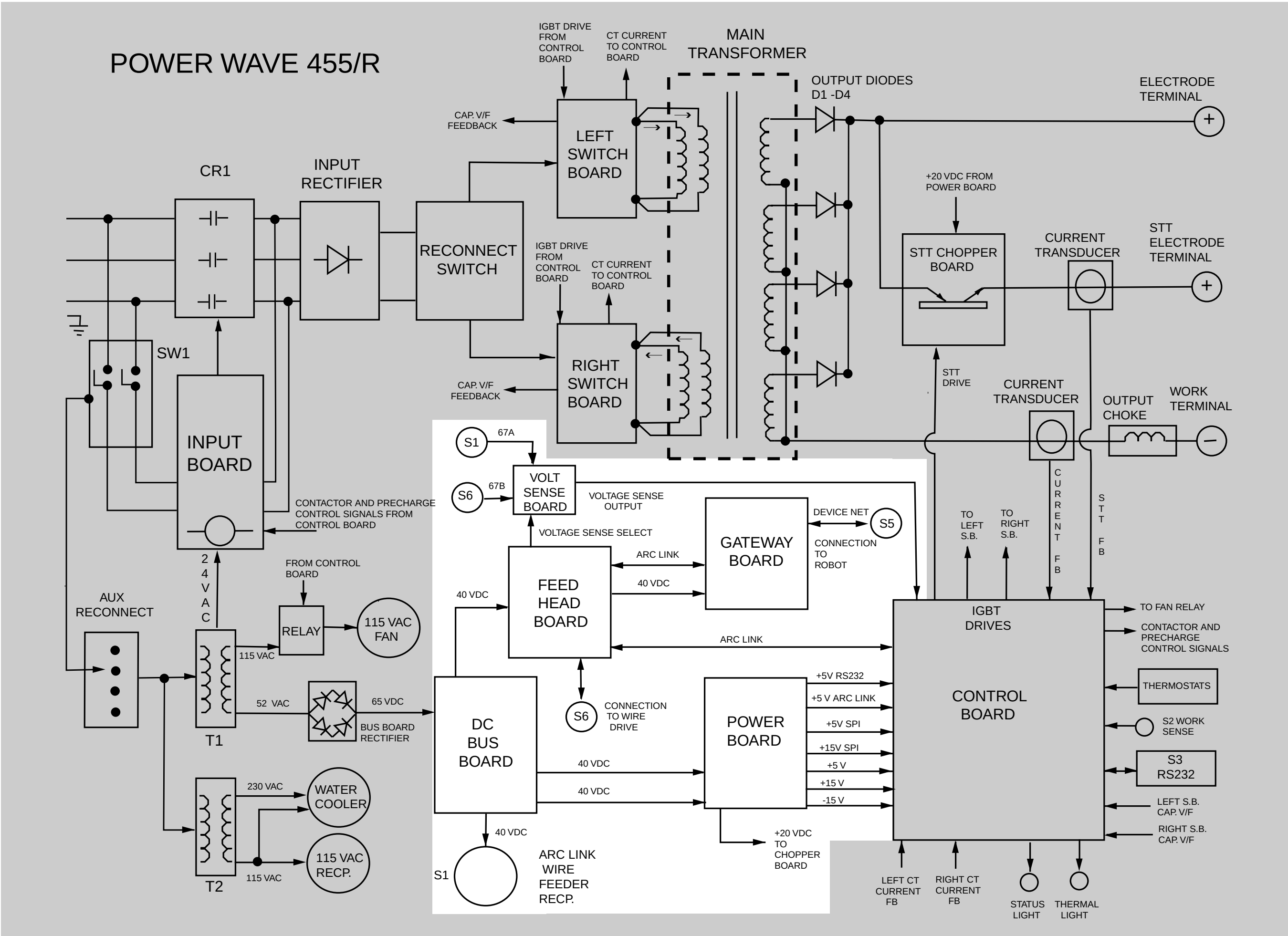
When the input capacitors are fully charged, they act as power supplies for the IGBT switching circuits. The insulated gate bipolar transistors switch the DC power from the input capacitors "on and off," thus supplying pulsed DC current to the main transformer primary windings. See ***IGBT OPERATION DISCUSSION AND DIAGRAMS*** in this section.

Each switch board feeds current to a separate, oppositely wound primary winding in the Main Transformer. The reverse directions of current flow through the main transformer primaries, and the offset timing of the IGBT switch boards induce an AC square wave output signal at the secondary of the main transformer. Current transformers located on the switch boards monitor the primary currents. If the primary currents become abnormally high, the Control Board will shut off the IGBTs, thus disabling the machine's output. The DC current flow through each primary winding is clamped back to each respective input capacitor when the IGBTs are turned off. This is needed due to the inductance of the transformer primary windings. The firing of the two switch boards occurs during halves of a 50-microsecond interval, creating a constant 20 KHZ output.

NOTE: Unshaded areas of Block Logic Diagram are the subject of discussion.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

FIGURE E-4 – DC BUS BOARD, POWER BOARD, FEED HEAD BOARD, GATEWAY BOARD AND VOLTAGE SENSE BOARD



DC BUS BOARD, POWER BOARD, FEED HEAD BOARD, GATEWAY BOARD AND VOLTAGE SENSE BOARD

The DC Bus Board receives approximately 65VDC from the Bus Board rectifier. The DC Bus Board regulates that 65VDC to a +40VDC supply. This regulated 40VDC is applied to the Feed Head Board, the Power Board, and the wire feeder receptacle.

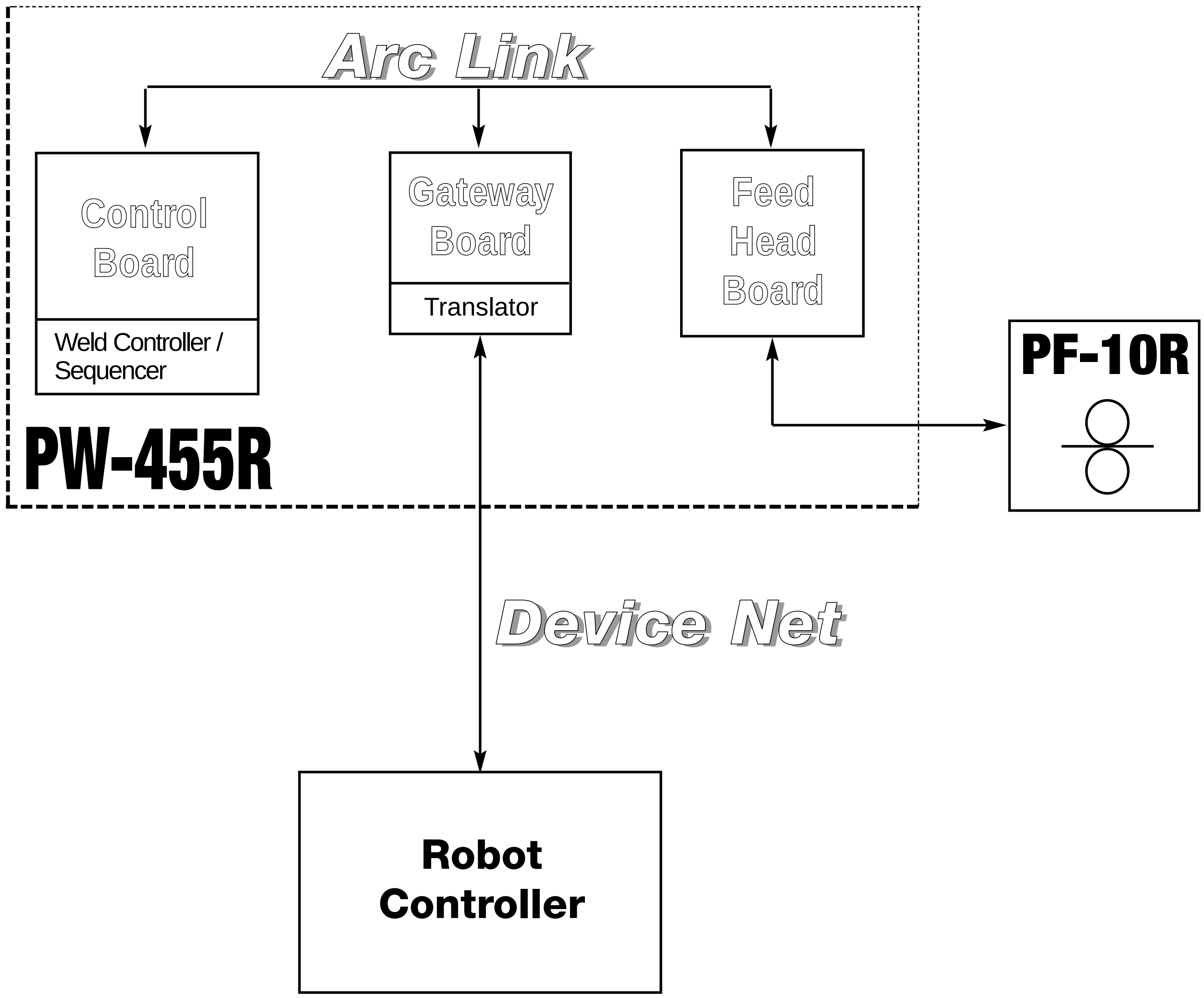
The switching power supplies on the Power Board supply a variety of regulated DC voltages to the Control Board and a +20VDC to the STT Chopper Board. The Control Board uses these regulated voltages to power the many circuits and communication functions incorporated within the Control Board.

When the Feed Head Board activates the Voltage Sense Board, the actual arc voltage is sensed (lead 67), and this information is delivered through the voltage sense board to the Control Board.

The Power Wave 455R uses two digital communication platforms. Internally the PC boards communicate via ArcLink. Externally the Power Wave 455R communicates using the industry standard Device Net protocol. The Gateway Board makes the translation between the two platforms possible. The Power Wave 455R does not have a dedicated interface device or board. The robot (or other input device – PLC, etc.) acts as the user interface, issuing commands through the Device Net protocol that are translated by the Gateway Board to ArcLink compatible messages. The following block diagram ***(Figure E.5)*** depicts the flow of communication information.

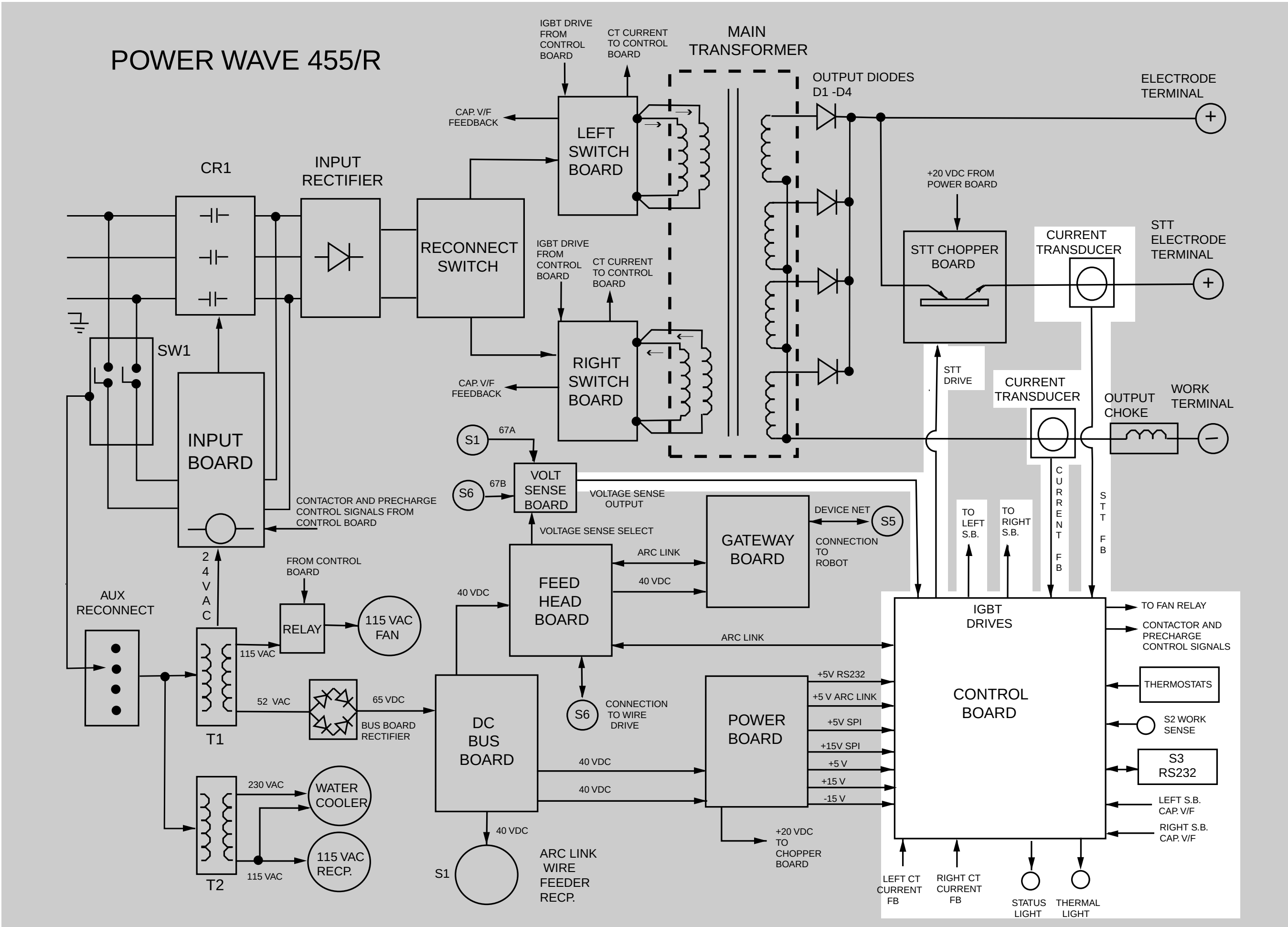
NOTE: Unshaded areas of Block Logic Diagram are the subject of discussion.

FIGURE E.5 – POWER WAVE 455/R COMMUNICATIONS



Return to Section TOC
Return to Master TOC

FIGURE E.6 – CONTROL BOARD



CONTROL BOARD

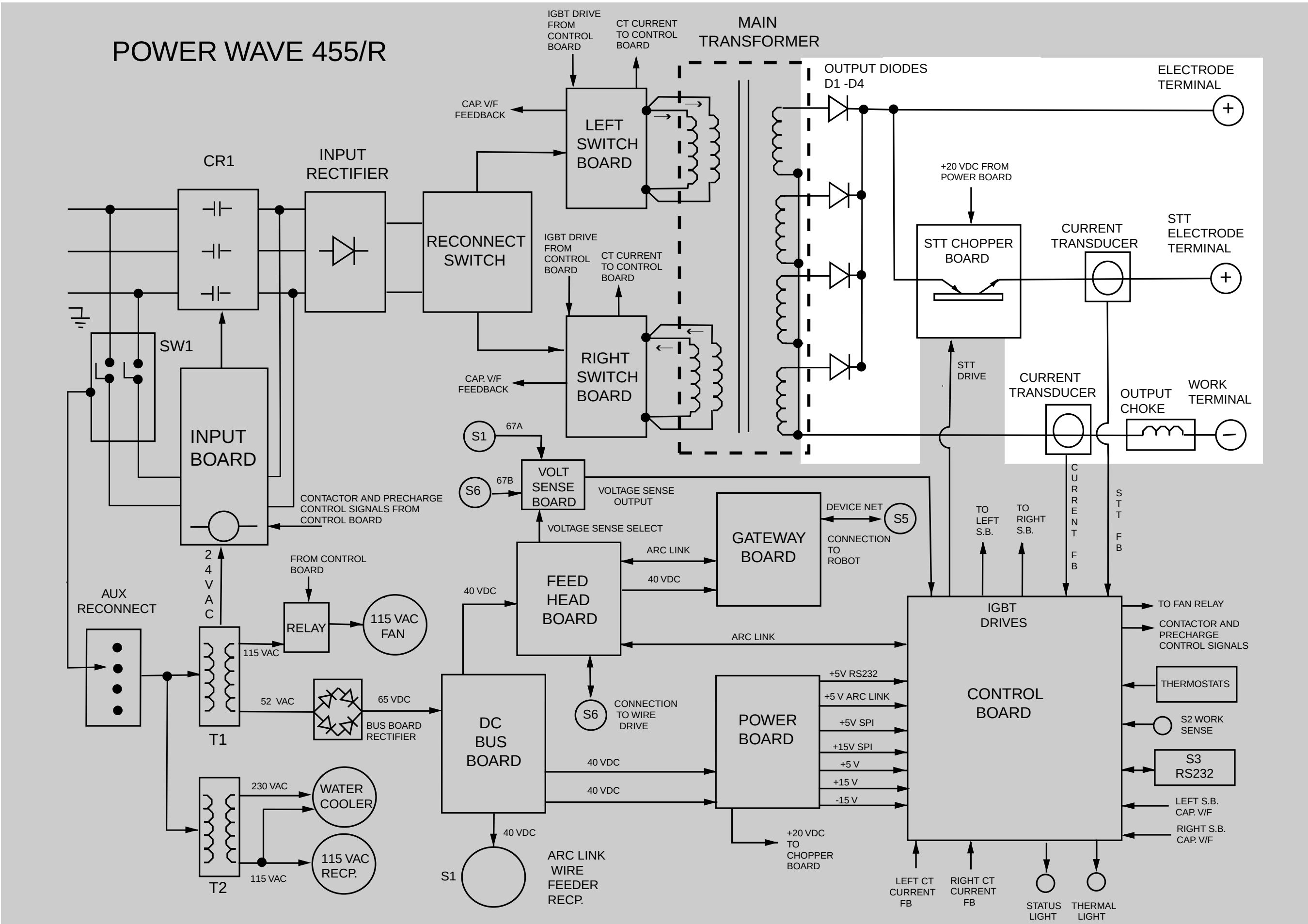
The Control Board performs the primary interfacing functions to establish and maintain output control of the Power Wave 455R machine. The function generator and weld files exist within the Control Board hardware and software. Digital command signals and feedback information is received and processed at the Control Board. Software within the Control Board processes the command and feedback information and sends the appropriate pulse width modulation (PWM) signals (see ***PULSE WIDTH MODULATION*** in this section) to the switch board IGBTs. In this manner, the digitally controlled high-speed welding waveform is created.

The Control Board also monitors and controls the STT (Surface Tension Transfer) circuitry incorporated in the Power Wave 455R. STT output currents and arc voltages are monitored, and the appropriated gate firing signals are applied (or removed) from the STT Chopper Board and switch boards to create a low spatter, low fume MIG welding process. See ***GENERAL DESCRIPTION OF STT (SURFACE TENSION TRANSFER PROCESS)*** in this section.

In addition, the Control Board monitors the thermostats, the main transformer primary currents and input filter capacitor voltages. Depending on the fault condition, the Control Board will activate the thermal and/or the status light and will disable or reduce the machine output. In some conditions the input contactor will be de-energized.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

FIGURE E.7 – OUTPUT RECTIFIER, OUTPUT CHOKE AND STT CHOPPER BOARD



OUTPUT RECTIFIER, OUTPUT CHOKE AND STT CHOPPER BOARD

The output rectifier receives the AC output from the main transformer secondary and rectifies it to a DC voltage level. The output choke is in series with the negative leg of the output rectifier and also in series with the welding load. Due to the current "smoothing" capability of the output choke, a filtered DC output current is applied through machine output terminals to the welding arc.

The STT Chopper Board is in series with the STT output terminal and is used to interrupt the welding current for very short periods of time during the short-arc MIG welding process. The IGBT modules incorporated on this board receive their gate firing commands from the Control Board.

THERMAL PROTECTION

Three normally closed (NC) thermostats protect the machine from excessive operating temperatures. These thermostats are wired in series and are connected to the control board. One of the thermostats is located on the heat sink of the output rectifier, one on the DC bus, and one on the output choke. Excessive temperatures may be caused by a lack of cooling air or by operating the machine beyond its duty cycle or output rating. If excessive operating temperatures should occur, the thermostats will prevent output from the machine. The yellow thermal light, located on the front of the machine, will be illuminated. The thermostats are self-resetting once the machine cools sufficiently. If the thermostat shutdown was caused by excessive output or duty cycle and the fan is operating normally, the power switch may be left on and the reset should occur within a 15-minute period. If the fan is not turning or the intake air louvers are obstructed, the power must be removed from the machine and the fan condition or air obstruction corrected. On later production machines (above code 10500) the cooling fan runs only when necessary. The F.A.N. (fan as needed) system is controlled by the Control Board via a solid state relay.

PROTECTIVE CIRCUITS

Protective circuits are designed into the Power Wave 455/R to sense trouble and shut down the machine before damage occurs to the machine's internal components.

OVER CURRENT PROTECTION

If the average current exceeds 570 amps, the peak current will be limited to 100 amps until the average current decreases to under 50 amps or the system is retriggered.

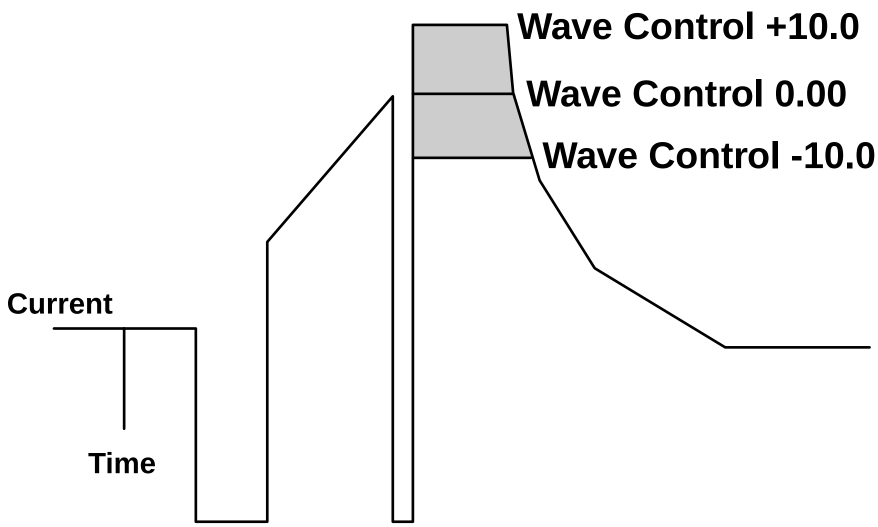
UNDER/OVER VOLTAGE PROTECTION

A protective circuit is included on the Control Board to monitor the voltage across the input capacitors. In the event that a capacitor voltage is too high, too low, or becomes unbalanced side-to-side, the protection circuit will de-energize the input contactor. Machine output will be disabled, and the "soft start" mode will be repeated. The protection circuit will prevent output if any of the following circumstances occur.

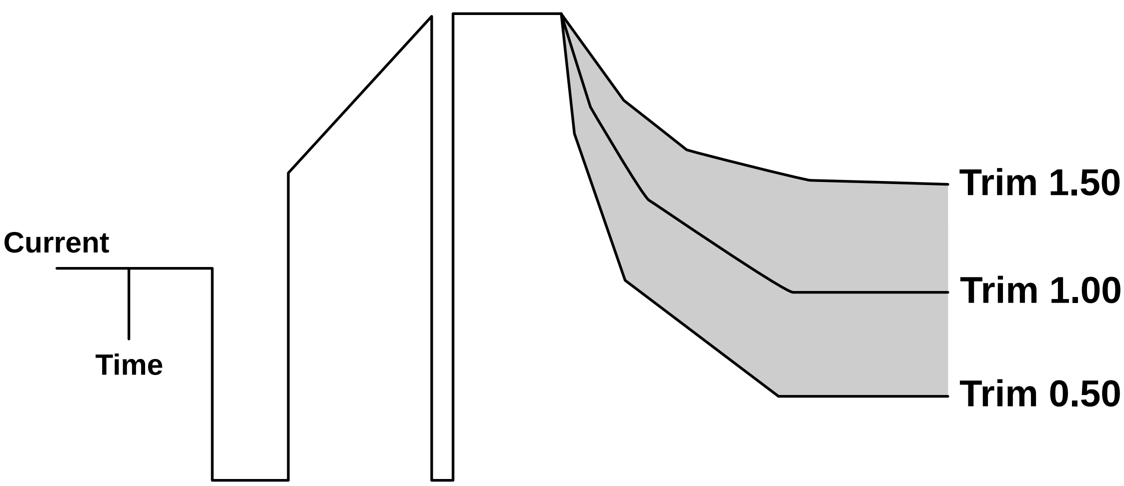
1. Capacitor conditioning is required. (This may be required if the machine has been off for a long period of time and is connected for high input voltage operation.)
2. Voltage across a capacitor exceeds 390 volts. (This could result from high line surges or improper input voltage connections.)
3. Voltage across a capacitor is under 70 volts. (This would be due to improper input voltage connections.)
4. Internal component damage.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

FIGURE E.8 – STT WAVEFORMS



STT Wave control characteristics

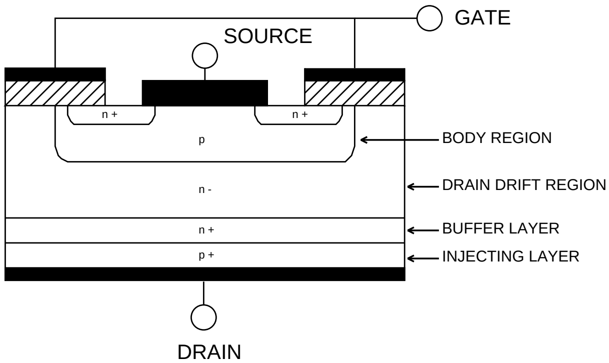


STT Trim control characteristics

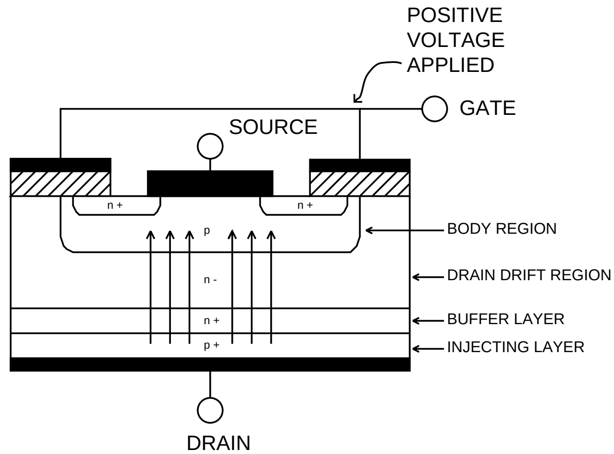
GENERAL DESCRIPTION OF THE STT (SURFACE TENSION TRANSFER) PROCESS

The STT process cannot be classified as either a constant current (CC) or a constant voltage (CV) application. The STT function produces current of a desired waveform to reduce spatter and fumes. The STT process is optimized for short-circuit GMAW welding only.

FIGURE E.9 – IGBT OPERATION



A. PASSIVE



B. ACTIVE

INSULATED GATE BIPOLAR TRANSISTOR (IGBT) OPERATION

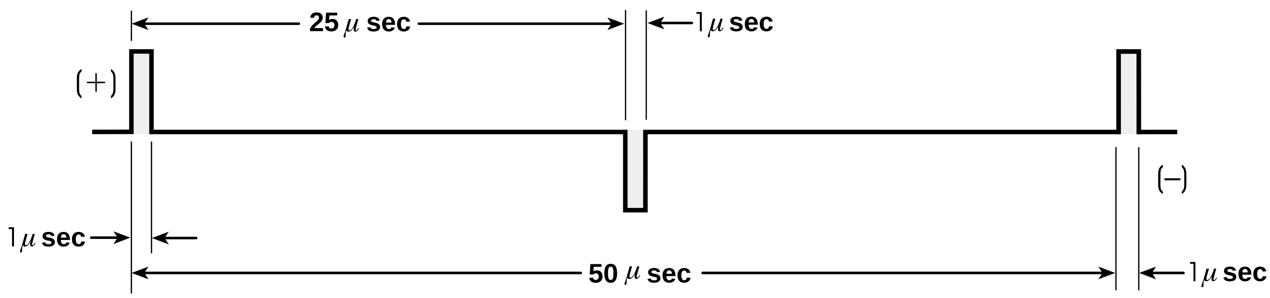
An IGBT is a type of transistor. IGBTs are semiconductors well suited for high frequency switching and high current applications.

Drawing A shows an IGBT in a passive mode. There is no gate signal, zero volts relative to the source, and therefore, no current flow. The drain terminal of the IGBT may be connected to a voltage supply; but since there is no conduction, the circuit will not supply current to components connected to the source. The circuit is turned off like a light switch in the OFF position.

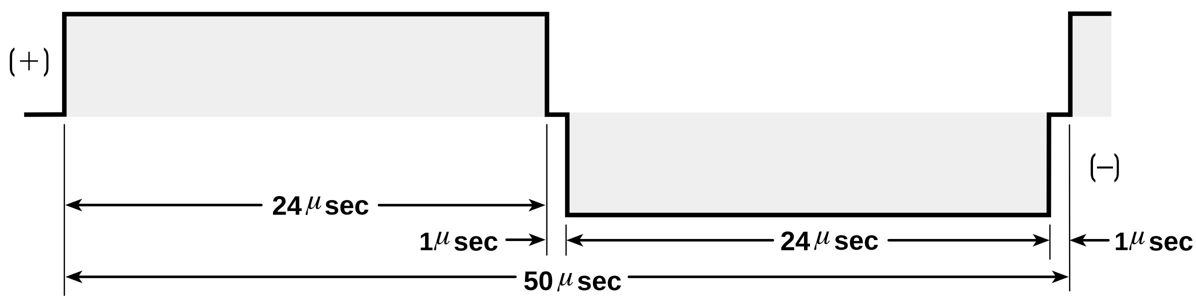
Drawing B shows the IGBT in an active mode. When the gate signal, a positive DC voltage relative to the source, is applied to the gate terminal of the IGBT, it is capable of conducting current. A voltage supply connected to the drain terminal will allow the IGBT to conduct and supply current to circuit components coupled to the source. Current will flow through the conducting IGBT to downstream components as long as the positive gate signal is present. This is similar to turning ON a light switch.

Return to Section TOC
Return to Master TOC

FIGURE E.10 – TYPICAL IGBT OUTPUTS



MINIMUM OUTPUT



MAXIMUM OUTPUT

PULSE WIDTH MODULATION

The term PULSE WIDTH MODULATION (PWM) is used to describe how much time is devoted to conduction in the positive and negative portions of the cycle. Changing the pulse width is known as MODULATION. Pulse Width Modulation is the varying of the pulse width over the allowed range of a cycle to affect the output of the machine.

MINIMUM OUTPUT

By controlling the duration of the gate signal, the IGBT is turned on and off for different durations during a cycle. The top drawing below shows the minimum output signal possible over a 50-microsecond time period.

The shaded portion of the signal represents one IGBT group[1], conducting for 1 microsecond. The negative portion is the other IGBT group. The dwell time (off time) is 48 microseconds (both IGBT groups off). Since only 2 microseconds of the 50-microsecond time period are devoted to conducting, the output power is minimized.

MAXIMUM OUTPUT

By holding the gate signals on for 24 microseconds each and allowing only 2 microseconds of dwell or off time (one microsecond during each half cycle) during the 50 microsecond cycle, the output is maximized. The darkened area under the minimum output curve can be compared to the area under the maximum output curve. The more darkened area, the more power is present.

[1] An IGBT group consists of the sets of IGBT modules grouped onto one switch board.

TABLE OF CONTENTS
- TROUBLESHOOTING & REPAIR SECTION -

Return to Master TOC
Return to Master TOC
Return to Master TOC
Return to Master TOC

HOW TO USE TROUBLESHOOTING GUIDE

⚠ WARNING

Service and repair should be performed by only Lincoln Electric Factory Trained Personnel. Unauthorized repairs performed on this equipment may result in danger to the technician and machine operator and will invalidate your factory warranty. For your safety and to avoid Electrical Shock, please observe all safety notes and precautions detailed throughout this manual.

This Troubleshooting Guide is provided to help you locate and repair possible machine malfunctions. Simply follow the three-step procedure listed below.

Step 1. LOCATE PROBLEM (SYMPTOM). Look under the column labeled "PROBLEM" (SYMPTOMS). This column describes possible symptoms that the machine may exhibit. Find the listing that best describes the symptom that the machine is exhibiting. Symptoms are grouped into two main categories: Output Problems and Function Problems.

Step 2. PERFORM EXTERNAL TESTS. The second column, labeled "POSSIBLE AREAS OF MISADJUSTMENT(S)", lists the obvious external possibilities that may contribute to the machine symptom. Perform these tests/checks in the order listed. In general, these tests can be conducted without removing the case cover.

Step 3. PERFORM COMPONENT TESTS. The last column, labeled "Recommended Course of Action" lists the most likely components that may have failed in your machine. It also specifies the appropriate test procedure to verify that the subject component is either good or bad. If there are a number of possible components, check the components in the order listed to eliminate one possibility at a time until you locate the cause of your problem.

All of the referenced test procedures referred to in the Troubleshooting Guide are described in detail at the end of this section. Refer to the Troubleshooting and Repair Table of Contents to locate each specific Test Procedure. All of the referred to test points, components, terminal strips, etc., can be found on the referenced electrical wiring diagrams and schematics. Refer to the Electrical Diagrams Section Table of Contents to locate the appropriate diagram.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-800-833-9353.

Return to Section TOC
Return to Master TOC

PC BOARD TROUBLESHOOTING PROCEDURES

⚠ WARNING

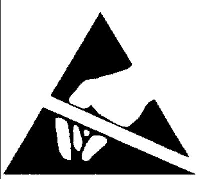


ELECTRIC SHOCK can kill.

Have an electrician install and service this equipment. Turn the machine OFF before working on equipment. Do not touch electrically hot parts.

Sometimes machine failures appear to be due to PC board failures. These problems can sometimes be traced to poor electrical connections. To avoid problems when troubleshooting and replacing PC boards, please use the following procedure:

1. Determine to the best of your technical ability that the PC board is the most likely component causing the failure symptom.
2. Check for loose connections at the PC board to assure that the PC board is properly connected.
3. If the problem persists, replace the suspect PC board using standard practices to avoid static electrical damage and electrical shock. Read the warning inside the static resistant bag and perform the following procedures:



ATTENTION
Static-Sensitive Devices
Handle only at Static-Safe Workstations

PC Board can be damaged by static electricity.

- Remove your body's static charge before opening the static-shielding bag. Wear an anti-static wrist strap. For safety, use a 1 Meg ohm resistive cord connected to a grounded part of the equipment frame.
- If you don't have a wrist strap, touch an unpainted, grounded, part of the equipment frame. Keep touching the frame to prevent static build-up. Be sure not to touch any electrically live parts at the same time.
- Tools which come in contact with the PC Board must be either conductive, anti-static or static-dissipative.
- Remove the PC Board from the static-shielding bag and place it directly into the equipment. Don't set the PC Board on or near paper, plastic or cloth which could have a static charge. If the PC Board can't be installed immediately, put it back in the static-shielding bag.
- If the PC Board uses protective shorting jumpers, don't remove them until installation is complete.
- If you return a PC Board to The Lincoln Electric Company for credit, it must be in the static-shielding bag. This will prevent further damage and allow proper failure analysis.

---

4. Test the machine to determine if the failure symptom has been corrected by the replacement PC board.

NOTE: Allow the machine to heat up so that all electrical components can reach their operating temperature.

5. Remove the replacement PC board and substitute it with the original PC board to recreate the original problem.
   a. If the original problem does not reappear by substituting the original board, then the PC board was not the problem. Continue to look for bad connections in the control wiring harness, junction blocks, and terminal strips.
   b. If the original problem is recreated by the substitution of the original board, then the PC board was the problem. Reinstall the replacement PC board and test the machine.
6. Always indicate that this procedure was followed when warranty reports are to be submitted.

NOTE: Following this procedure and writing on the warranty report, "INSTALLED AND SWITCHED PC BOARDS TO VERIFY PROBLEM," will help avoid denial of legitimate PC board warranty claims.

Observe Safety Guidelines
detailed in the beginning of this manual.

TROUBLESHOOTING GUIDE

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
Major physical or electrical damage is evident when the sheet metal covers are removed.	Contact your local authorized Lincoln Electric Field Service Facility for technical assistance.	Contact the Lincoln Electric Service Department at 1-800-833-9353 (WELD).
The input fuses repeatedly fail or the input circuit breakers keep tripping.	1. Make certain the fuses or breakers are properly sized. 2. Make certain the reconnect panel is configured properly for the applied voltage. 3. The welding procedure may be drawing too much input current or the duty cycle may be too high. Reduce the welding current and /or reduce the duty cycle.	1. Check the reconnect switches and associated wiring. See the Wiring Diagram. 2. Perform the ***Input Rectifier Test.*** 3. Perform the ***Switch Board Test.*** 4. Perform the ***Input Contactor Test.***

CAUTION

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-800-833-9353.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

TROUBLESHOOTING GUIDE

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
The machine is dead—no lights—no output—the machine appears to be off.	1. Make certain the input power switch SW1 is in the ON position. 2. Check the main input fuses (or breakers). If open, replace or reset. 3. Check the 6 amp CB4 breaker located in the reconnect area. Reset if tripped. 4. Make certain the reconnect panel is configured correctly for the applied input voltage.	1. Check the input power switch SW1 for proper operation. Also check the associated leads for loose or faulty connections. See the Wiring Diagram. 2. Check circuit breaker CB4 for proper operation. 3. Perform the ***T1 Auxiliary Transformer Test.*** 4. The power board rectifier may be faulty. Check rectifier and associated wiring. See the Wiring Diagram. 5. Perform the ***DC Bus Board Test.*** 6. Perform the ***Power Board Test.*** 7. The Control Board may be faulty.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-800-833-9353.

Return to Section TOC
Return to Master TOC

**Observe Safety Guidelines
detailed in the beginning of this manual.**

TROUBLESHOOTING GUIDE

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
The Power Wave 455R does not have welding output. The main input contactor CR1 is not activating.	1. Turn the input power off and make certain the reconnect panel is configured correctly for the applied input voltage. 2. If the Thermal light is lit, the unit may be overheated. Let the machine cool and adjust welding load and /or duty cycle to coincide with the output limits of the machine.	1. Perform the ***Input Contactor Test.*** 2. Perform the ***Input Board Test.*** 3. Perform the ***T1 Auxiliary Transformer Test.*** 4. Perform the ***Input Rectifier Test.*** 5. Perform the ***Switch Board Test.*** 6. Perform the ***Power Board Test.*** 7. The Control Board may be faulty.
The thermal light is lit. The machine regularly "overheats."	1. The welding application may be exceeding the recommended duty cycle and/or current limits of the machine. 2. Dirt and dust may have clogged the cooling channels inside the machine. Refer to the ***Maintenance Section*** of this manual. 3. Air intake and exhaust louvers may be blocked due to inadequate clearance around the machine. 4. Make sure the fan is functioning correctly. Machines above code 10500 are equipped with F.A.N. (fan as needed) circuitry. The fan runs whenever the output is enabled, whether under load or open circuit conditions. The fan also runs for a period of time (approximately 5 minutes) after the output is disabled.	1. One of the thermostats may be faulty. Also check associated wiring for loose or faulty connections. See the Wiring Diagram.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-800-833-9353.

TROUBLESHOOTING GUIDE

Observe Safety Guidelines detailed in the beginning of this manual.

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
FUNCTION PROBLEMS		
The machine often "noodle welds" when running a particular process. The output is limited to approximately 100 amps.	1. The machine may be trying to deliver too much power. When the average output current exceeds 570 amps, the machine will "phase back" to protect itself. Adjust the procedure or reduce the load to lower the current draw from the Power Wave 455R machine.	1. Perform the ***Current Transducer Test.*** 2. The Control Board may be faulty.
The Power Wave 455R will not produce full output.	1. The input voltage may be too low, limiting the output capability of the machine. Make certain the input voltage is correct for the machine and the reconnect panel configuration. 2. Make sure all three phases of input power are being applied to the machine. 3. If using the STT output terminal, be aware that the STT output is limited to 325 amps.	1. Perform the ***Output Rectifier Test.*** 2. Perform the ***Current Transducer Test.*** 3. Perform the ***Power Board Test.*** 4. The Control Board may be faulty. 5. If using the STT output terminal, the STT Chopper Board may be faulty. See the Wiring Diagram.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-800-833-9353.

Observe Safety Guidelines detailed in the beginning of this manual.

TROUBLESHOOTING GUIDE

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
FUNCTION PROBLEMS		
The Auxiliary Receptacle is "dead." The 120VAC is not present at the receptacle.	1. Check the 10 amp circuit breaker (CB2) located on the case front. Reset if necessary. 2. Check the 6 amp circuit breaker (CB4) located in the reconnect area. Reset if necessary. 3. Make sure all three phases of input power are being applied to the machine.	1. Check the receptacle and associated wiring for loose or faulty connections. See the Wiring Diagram. 2. Perform the ***T2 Auxiliary Transformer Test.***
The Power Wave 455R is "triggered" for output but there is no welding output.	1. Make sure that the triggering method and device is correct and operating properly. 2. Check circuit breaker CB4. Reset if tripped.	Use troubleshooting software to find the problem. Contact Lincoln Electric Service Department to obtain software.
When in the STT mode, the spatter is higher than normal and the arc is inconsistent.	1. Make certain the work sense lead (21) is connected properly. 2. Make certain the electrode cable is connected only to the STT output terminal and NOT the Power Wave positive output terminal. 3. Make sure the welding parameters are correct for the process.	1. Perform the ***STT Chopper Board Test.*** 2. Perform the ***Current Transducer (STT) Test.*** 3. The Control Board may be faulty.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-800-833-9353.

Return to Section TOC
Return to Master TOC

INPUT FILTER CAPACITOR DISCHARGE PROCEDURE

WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-800-833-9353 (WELD).

DESCRIPTION

This “safety” procedure should be performed before any internal maintenance or repair procedures are attempted on the Power Wave 455/R. Capacitance normally discharges within 2 minutes of removing input power. This procedure is used to check that the capacitors have properly discharged.

MATERIALS NEEDED

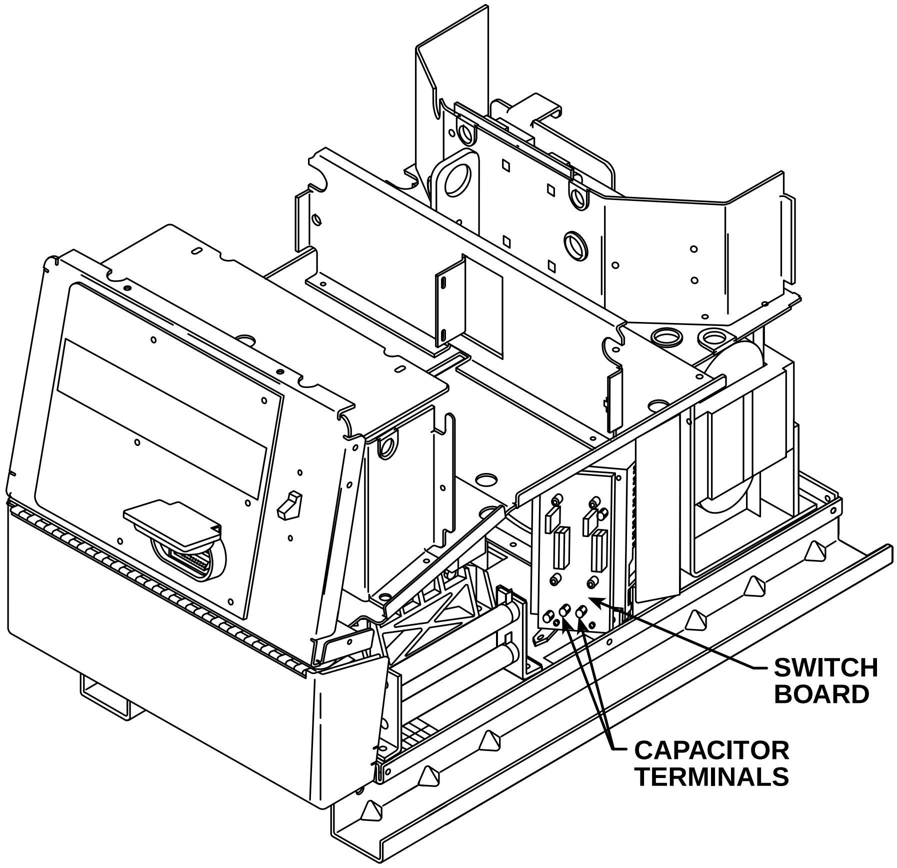
3/8” Nut driver
Volt-ohmmeter
25-1000 ohms @ 25 watts (minimum) resistor
Electrically insulated gloves and pliers

This procedure should take approximately 15 minutes to perform.

Return to Section TOC
Return to Master TOC

INPUT FILTER CAPACITOR DISCHARGE PROCEDURE *(CONTINUED)*

FIGURE F.1 – CAPACITOR DISCHARGE PROCEDURE



TEST PROCEDURE

1. Remove input power to the Power Wave 455/R.
2. Using the 3/8" nut driver, remove the left and right case sides.
3. Be careful not to make contact with the capacitor terminals that are located in the bottom center of the left and right side switch boards. See Figure F.1.
4. Carefully check for a DC voltage at the capacitor terminals on both boards. Note the polarity is marked on the PC board and also lead #19 is positive.
5. If any voltage is present, proceed to Step #6. If no voltage is present, the capacitors are discharged.

NOTE: Normally the capacitors discharge in about two minutes after input power is removed.

6. Using the high wattage resistor (25-1000 ohms @ 25 watts (minimum), electrically insulated gloves and pliers, connect the resistor across the two capacitor terminals. Hold the resistor in place for 10 seconds. DO NOT TOUCH THE CAPACITOR TERMINALS WITH YOUR BARE HANDS. **NEVER USE A SHORTING STRAP FOR THIS PROCEDURE.**
7. Repeat procedure for the other capacitor.
8. Recheck the voltage across the capacitor terminals. The voltage should be zero. If any voltage remains, repeat the discharge procedure.

NOTE: If the capacitor voltage is present after the discharge has been performed, this may indicate a faulty switch board.

Return to Section TOC
Return to Master TOC

SWITCH BOARD TEST

WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-800-833-9353 (WELD).

DESCRIPTION

This test will help determine if the "power section" of the switch boards are functioning correctly. This test will NOT indicate if the entire PC board is functional. This resistance test is preferable to a voltage test with the machine energized because these boards can be damaged easily. In addition, it is dangerous to work on these boards with the machine energized.

MATERIALS NEEDED

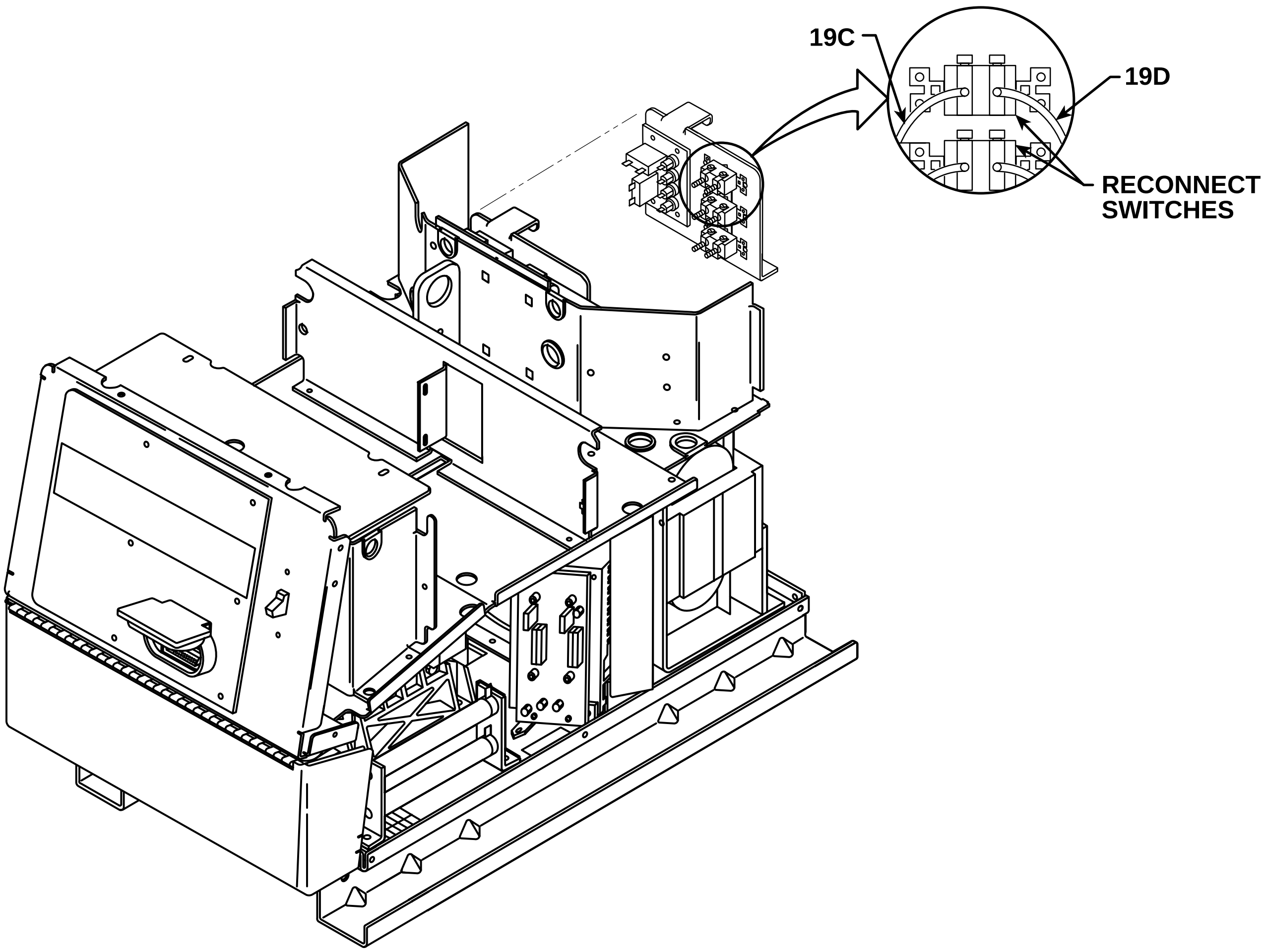
3/8" Nut driver
3/8" Wrench
Analog volt-ohmmeter
Wiring Diagram

This procedure should take approximately 20 minutes to perform.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

SWITCH BOARD TEST *(CONTINUED)*

FIGURE F.2 – RECONNECT SWITCHES



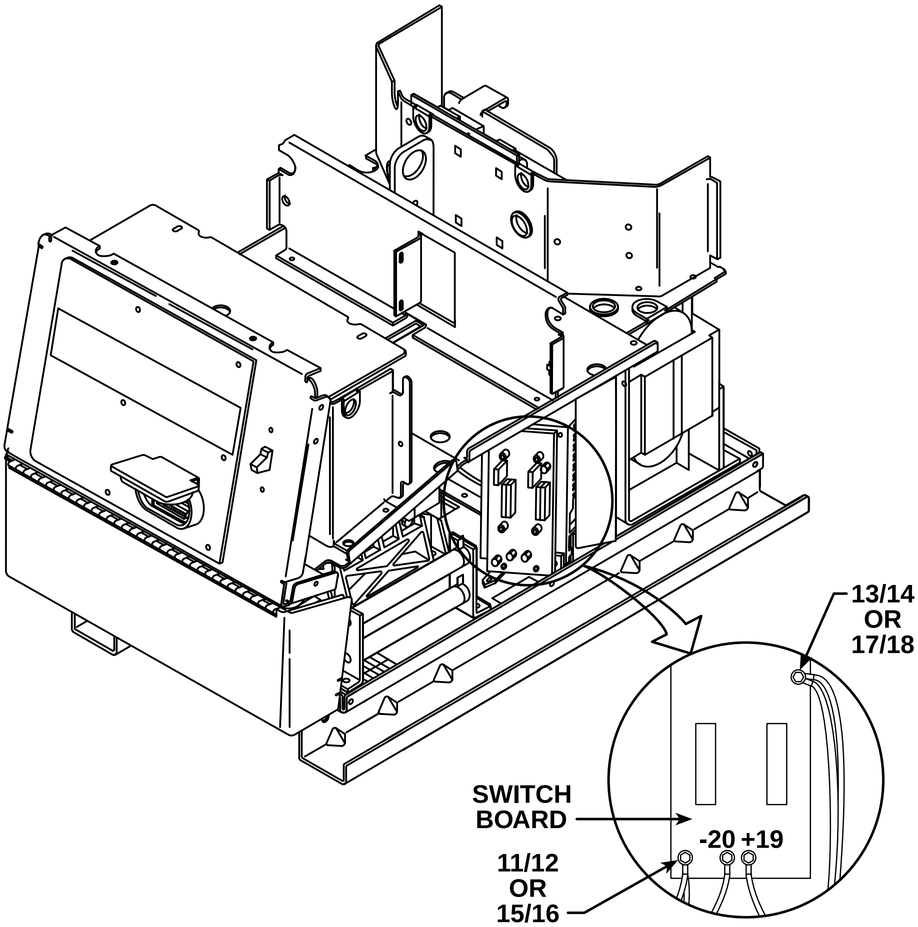
TEST PROCEDURE

1. Remove input power to the Power Wave 455/R.
2. Using the 3/8" nut driver, remove the case top and sides.
3. Perform the ***Capacitor Discharge*** Procedure.
4. Locate label and remove leads 19C and 19D from the reconnect switches with the 3/8" wrench. Note lead placement for reassembly. Clear leads. Refer to Figure F.2.
5. Using the Analog ohmmeter, perform the resistance tests detailed in ***Table F.1.*** Refer to ***Figure F.3*** for the test points.
6. If any test fails replace both switch boards. See ***Switch Board Removal and Replacement.***
7. If the switch board resistance tests are OK, check the molex pin connections and associated wiring from the switch boards to the control board. See the Wiring Diagram.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

SWITCH BOARD TEST *(CONTINUED)*

FIGURE F.3 – SWITCH BOARD TEST POINTS



8. Reconnect leads 19C and 19D to the reconnect switches. Ensure that the leads are installed in the same location they were removed from.

9. Install the right and left case sides and top using the 3/8" nut driver.

TABLE F.1 – SWITCH BOARD RESISTANCE TEST

APPLY POSITIVE TEST PROBE TO TERMINAL	APPLY NEGATIVE TEST NORMAL PROBE TO TERMINAL	RESISTANCE READING
+19	11/12 OR 15/16	Greater than 1000 ohms
+19	13/14 OR 17/18	Greater than 1000 ohms
11/12 OR 15/16	- 20	Greater than 1000 ohms
13/14 OR 17/18	- 20	Greater than 1000 ohms
- 20	11/12 OR 15/16	Less than 100 ohms
- 20	13/14 OR 17/18	Less than 100 ohms
11/12 OR 15/16	+19	Less than 100 ohms
13/14 OR 17/18	+19	Less than 100 ohms

Return to Section TOC
Return to Master TOC

INPUT RECTIFIER TEST

WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-800-833-9353 (WELD).

TEST DESCRIPTION

This test will help determine if the input rectifier has “shorted” or “open” diodes.

MATERIALS NEEDED

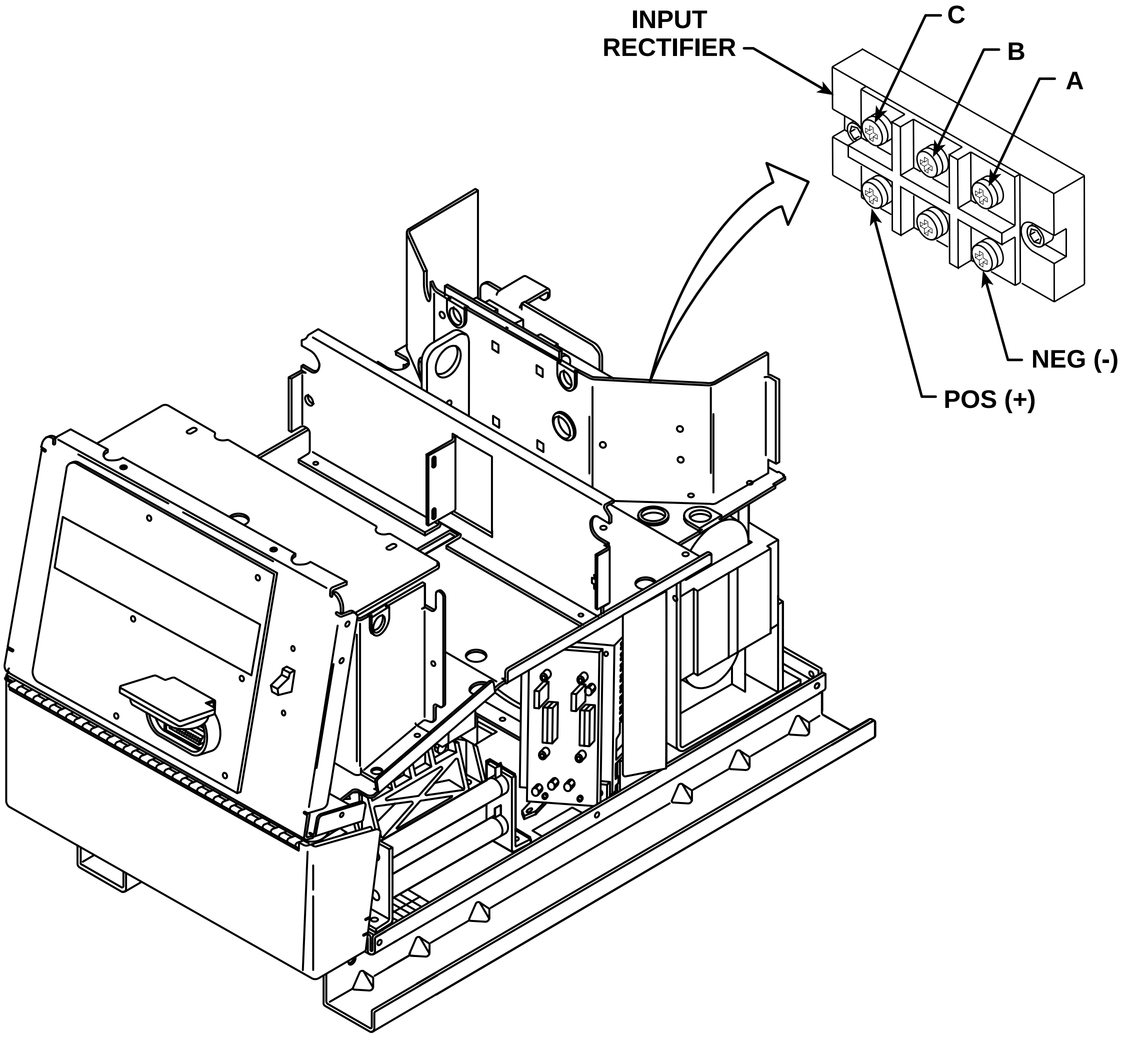
Analog volt-ohmmeter
Phillips head screw driver
Wiring Diagram
3/8” Nut driver

This procedure should take approximately 15 minutes to perform.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

INPUT RECTIFIER TEST *(CONTINUED)*

FIGURE F.4 – INPUT RECTIFIER TEST



TEST PROCEDURE

1. Remove input power to the Power Wave 455/R.
2. Using the 3/8" nut driver, remove the case top.
3. Perform the ***Capacitor Discharge*** Procedure.
4. Locate the Input Rectifier and lead locations. Refer to Figure F.4.

NOTE: Some RTV sealant may have to be removed from the input rectifier terminals. The RTV should be replaced when test is complete.

5. With the phillips head screw driver remove the positive and negative leads from the rectifier.

INPUT RECTIFIER TEST *(CONTINUED)*

6. Use the analog ohmmeter to perform the tests detailed in Table F.2.
7. If the input rectifier does not meet the acceptable readings outlined in the table, the component may be faulty. Replace.

NOTE: Before replacing the input rectifier, perform ***the Switch Board Test*** and the ***Input Contactor Test.***

8. When installing a new input rectifier, see ***Input Rectifier Removal and Replacement*** procedure.
9. If the input rectifier is good, be sure to reconnect the positive and negative leads to the correct terminals and torque to 31 in.-lbs. See the Wiring Diagram.
10. Replace any RTV sealant previously removed.
11. Install the case top.

TABLE F.2 – INPUT RECTIFIER TEST POINTS AND ACCEPTABLE READINGS

TEST POINT TERMINALS		ANALOG METER X100 RANGE
+ Probe	**- Probe**	**Acceptable Meter Readings**
A	NEG	Greater than 1000 ohms
B	NEG	Greater than 1000 ohms
C	NEG	Greater than 1000 ohms
A	POS	Approx. 500 ohms
B	POS	Approx. 500 ohms
C	POS	Approx. 500 ohms
NEG	A	Approx. 500 ohms
NEG	B	Approx. 500 ohms
NEG	C	Approx. 500 ohms
POS	A	Greater than 1000 ohms
POS	B	Greater than 1000 ohms
POS	C	Greater than 1000 ohms

Return to Section TOC
Return to Master TOC

INPUT CONTACTOR TEST

WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-800-833-9353 (WELD).

TEST DESCRIPTION

This test will help determine if the input contactor is functional and if the contacts are functioning correctly.

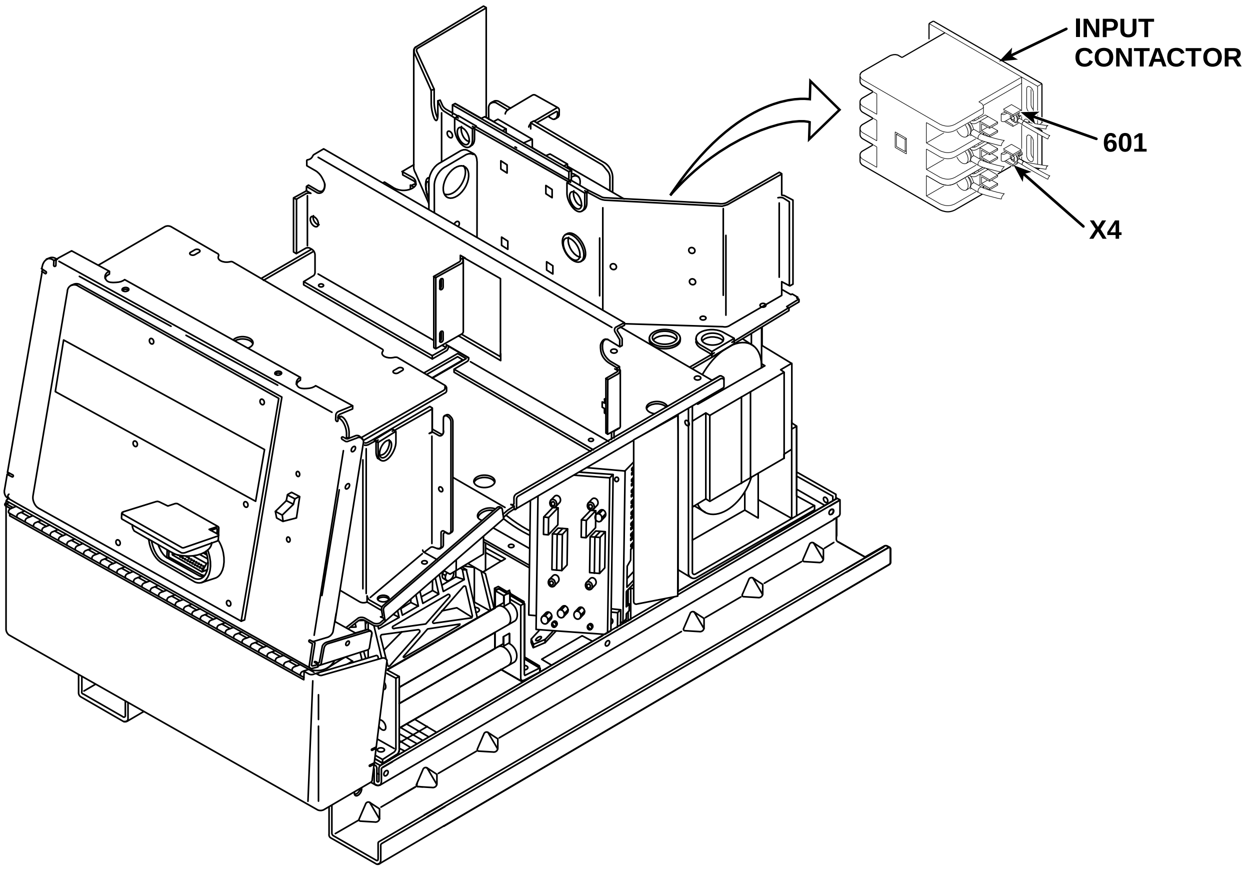
MATERIALS NEEDED

3/8" Nut driver
Volt-ohmmeter
External 24 VAC supply

This procedure should take approximately 17 minutes to perform.

INPUT CONTACTOR TEST *(CONTINUED)*

FIGURE F.5 – INPUT CONTACTOR COIL



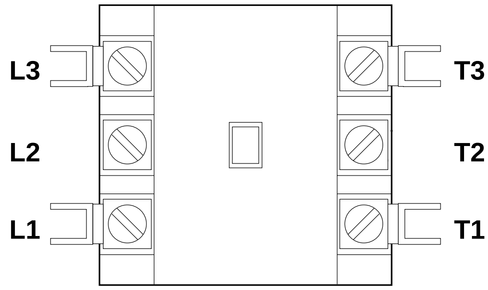
TEST PROCEDURE

1. Remove input power to the Power Wave 455/R.
2. Using the 3/8” nut driver, remove the input access panel and case top.
3. Locate, mark, and remove the two leads (601, X4) that are connected to the input contactor coil. Refer to Figure F.5.
4. Using the external 24 VAC supply, apply 24 VAC to the terminals of the input contactor coil. If the contactor does NOT activate, the input contactor is faulty. Replace.

Return to Section TOC
Return to Master TOC

INPUT CONTACTOR TEST *(CONTINUED)*

FIGURE F.6 – INPUT CONTACTOR TEST POINTS



5. With the input contactor activated, check the continuity across the three sets of contacts. (Zero ohms or very low resistance is normal.) Refer to Figure F.6. If the resistance is high, the input contactor is faulty. Replace the input contactor.

6. When the contactor is NOT activated, the resistance should be infinite or very high across the contacts. If the resistance is low, the input contactor is faulty.

7. Reconnect the two leads (601, X4) to the input contactor coil.

8. Install the input access door and case top using the 3/8" nut driver.

DC BUS POWER SUPPLY PC BOARD TEST

⚠ WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-800-833-9353 (WELD).

TEST DESCRIPTION

This test will determine if the DC Bus Power Supply PC Board is receiving and processing the proper voltages.

MATERIALS NEEDED

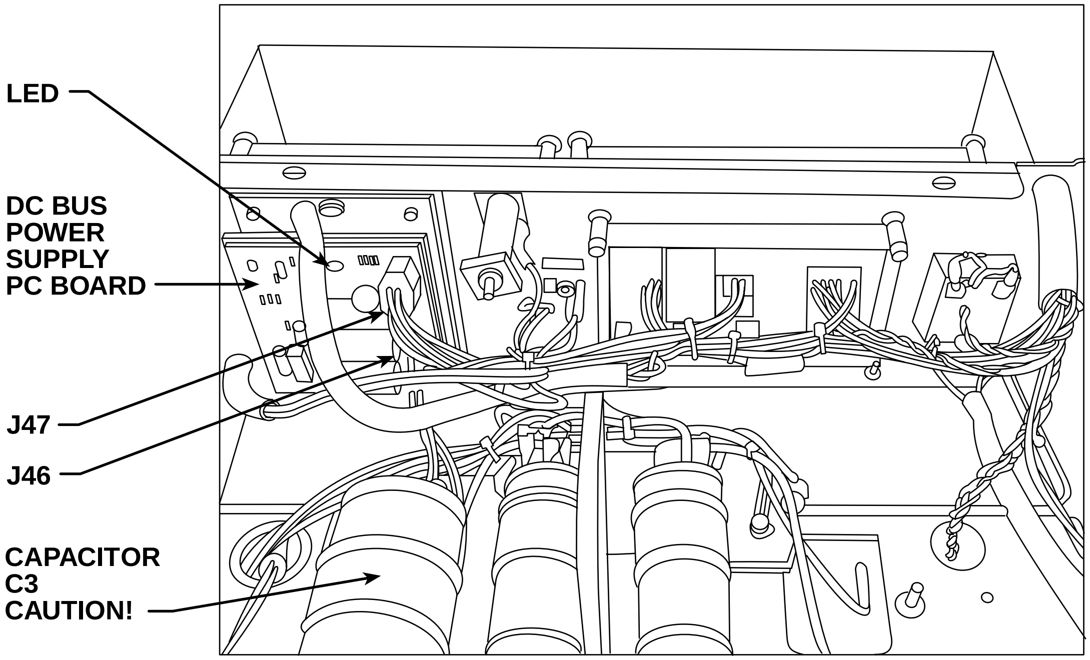
3/8” Nut driver
Volt/ohmmeter
Wiring Diagram

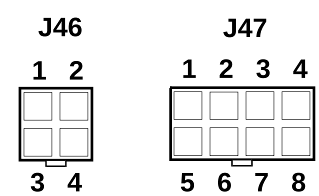
This procedure should take approximately 30 minutes to perform.

LINCOLN ELECTRIC

DC BUS POWER SUPPLY PC BOARD TEST *(CONTINUED)*

FIGURE F.7 – DC BUS POWER SUPPLY POWER SUPPLY PC BOARD





TEST PROCEDURE

1. Remove input power to the machine.
2. Using the 3/8" nut driver, remove the case top.
3. Locate the DC Bus Power Supply PC Board and plugs P46 and P47. See Figure F.7.
4. Carefully apply input power to the Power Wave 455/R.

⚠ WARNING



ELECTRIC SHOCK can kill.

High voltage is present when input power is applied to the machine.

5. Turn on the Power Wave 455/R. The LED on the DC Bus Power Supply PC Board should light.

Return to Section TOC
Return to Master TOC

DC BUS POWER SUPPLY PC BOARD TEST *(CONTINUED)*

6. Check the DC Bus Power Supply PC Board input and output voltages according to Table F.3. See ***Figure F.7*** and the Wiring Diagram.

WARNING



ELECTRIC SHOCK can kill.

High voltage is present at the terminals of Capacitor C3 near where testing is to be done.

7. If all the voltages are correct, the DC Bus Power Supply PC Board is operating properly.
8. If any of the output voltages are not correct and the input voltage is correct, the DC Bus Power Supply PC Board may be faulty.
9. If the input voltage is not correct, check the leads between the DC Bus Power Supply PC Board and the Power PC Board Rectifier. See the Wiring Diagram.
10. When finished testing, replace the case top.

TABLE F.3 – DC BUS POWER SUPPLY PC BOARD VOLTAGE TABLE

Positive Meter Probe Test Point	Negative Meter Probe Test Point	Approximate Voltage Reading	Conditions/Comments
Plug P46 – Pin 1	Plug P46 – Pin 3	65 – 75 VDC	Should be same as the Power PC Board Rectifier
Plug P47 – Pin 7	Plug P47 – Pin 6	38.0 – 42.0 VDC	Supply to Power PC Board
Plug P47 – Pin 8	Plug P47 – Pin 6	38.0 – 42.0 VDC	Supply to Power PC Board
Plug P47 – Pin 4	Plug P47 – Pin 2	38.0 – 42.0 VDC	Supply to Feed Head PC Board
Plug P47 – Pin 3	Plug P47 – Pin 1	38.0 – 42.0 VDC	Supply to S1 Wire Feeder Receptacle

Return to Section TOC
Return to Master TOC

POWER BOARD TEST

⚠ WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-800-833-9353 (WELD).

TEST DESCRIPTION

This test will help determine if the Power Board is receiving the correct voltages and also if the Power Board is regulating and producing the correct DC voltages.

MATERIALS NEEDED

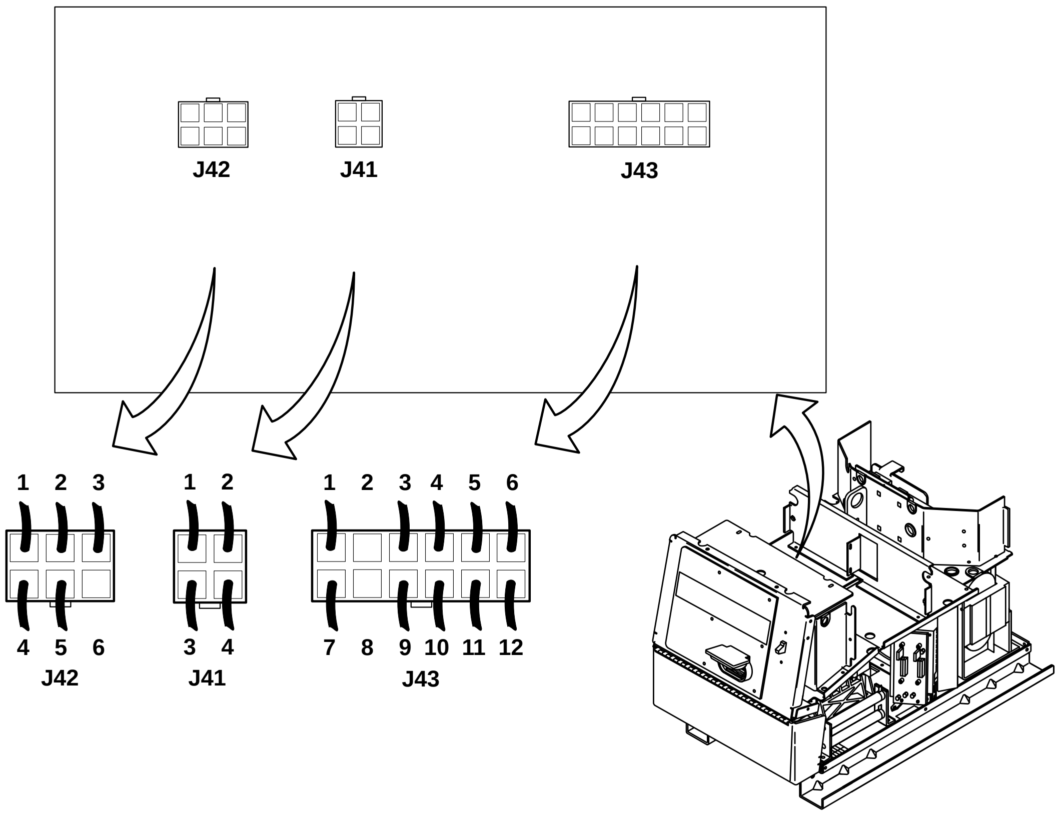
3/8” Nut driver
Volt-ohmmeter
Wiring Diagram

This procedure should take approximately 30 minutes to perform.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

POWER BOARD TEST *(CONTINUED)*

FIGURE F.8 – POWER BOARD TEST



TEST PROCEDURE

1. Remove input power to the Power Wave 455/R.
2. Using the 3/8” nut driver, remove the case top.
3. Perform the ***Capacitor Discharge*** Procedure.
4. Locate the Power Board and plugs J42 and J43. **Do not remove plugs or leads from the Power Board**. Refer to Figure F.8.
5. Carefully apply input power to the Power Wave 455/R.

WARNING



ELECTRIC SHOCK can kill.

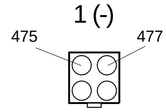
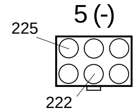
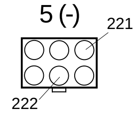
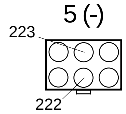
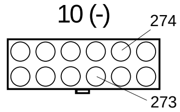
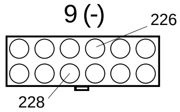
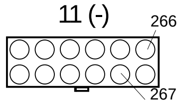
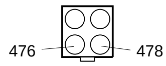
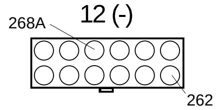
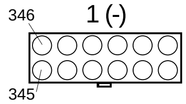
High voltage is present when input power is applied to the machine.

6. Turn on the Power Wave 455/R. Carefully test for the correct voltages at the Power Board according to ***Table F.4.***
7. If either of the 40 VDC voltages is low or not present at plug J41, perform the ***DC Bus PC Board Test***. See the Wiring Diagram. Also perform the ***T1 Auxiliary Transformer Test.***
8. If any of the DC voltages are low or not present at plugs J42 and/or 43, the Power Board may be faulty.
9. Install the case top using the 3/8” nut driver.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

POWER BOARD TEST *(CONTINUED)*

TABLE F.4 – POWER BOARD VOLTAGE CHECKS

CHECK POINT LOCATION	TEST DESCRIPTION	CONNECTOR PLUG PIN NO.	LEAD NO. OR IDENTITY	NORMAL ACCEPTABLE VOLTAGE READING
POWER BOARD CONNECTOR PLUG J41	CHECK 40 VDC INPUT FROM DC BUS BOARD	2 (+) 1 (-) 	477 (+) 475 (-)	38 – 42 VDC
POWER BOARD CONNECTOR PLUG J42	CHECK +15 VDC SUPPLY FROM POWER BOARD	1 (+) 5 (-) 	225 (+) 222 (-)	+15 VDC
POWER BOARD CONNECTOR PLUG J42	CHECK +5 VDC SUPPLY FROM POWER BOARD	3 (+) 5 (-) 	221 (+) 222 (-)	+5 VDC
POWER BOARD CONNECTOR PLUG J42	CHECK -15 VDC SUPPLY FROM POWER BOARD	2 (+) 5 (-) 	222 (+) 223 (-)	-15 VDC
POWER BOARD CONNECTOR PLUG J43	CHECK +5 VDC ARCLINK SUPPLY FROM POWER BOARD	5 (+) 10 (-) 	274 (+) 273 (-)	+5 VDC
POWER BOARD CONNECTOR PLUG J43	CHECK +5 VDC "RS-232" SUPPLY FROM POWER BOARD	4 (+) 9 (-) 	226 (+) 228 (-)	+5 VDC
POWER BOARD CONNECTOR PLUG J43	CHECK +15 VDC SPI SUPPLY FROM POWER BOARD	6 (+) 11 (-) 	266 (+) 267 (-)	+15 VDC
POWER BOARD CONNECTOR PLUG J41	CHECK +40 VDC INPUT FROM DC BUS BOARD	4 (+) 3 (-) 	478 (+) 476 (-)	38 – 42 VDC
POWER BOARD CONNECTOR PLUG J43	CHECK +5 VDC SPI SUPPLY FROM POWER BOARD	3 (+) 12 (-) 	268A (+) 262 (-)	+5 VDC
POWER BOARD CONNECTOR PLUG J43	CHECK +20 VDC STT SUPPLY FROM POWER BOARD	7 (+) 1 (-) 	345 (+) 346 (-)	+20 VDC

Return to Section TOC
Return to Master TOC

INPUT BOARD TEST

WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-800-833-9353 (WELD).

TEST DESCRIPTION

This test will help determine if the Input Board is sending the correct voltages and also if the Input Board is regulating and producing the correct DC voltages.

MATERIALS NEEDED

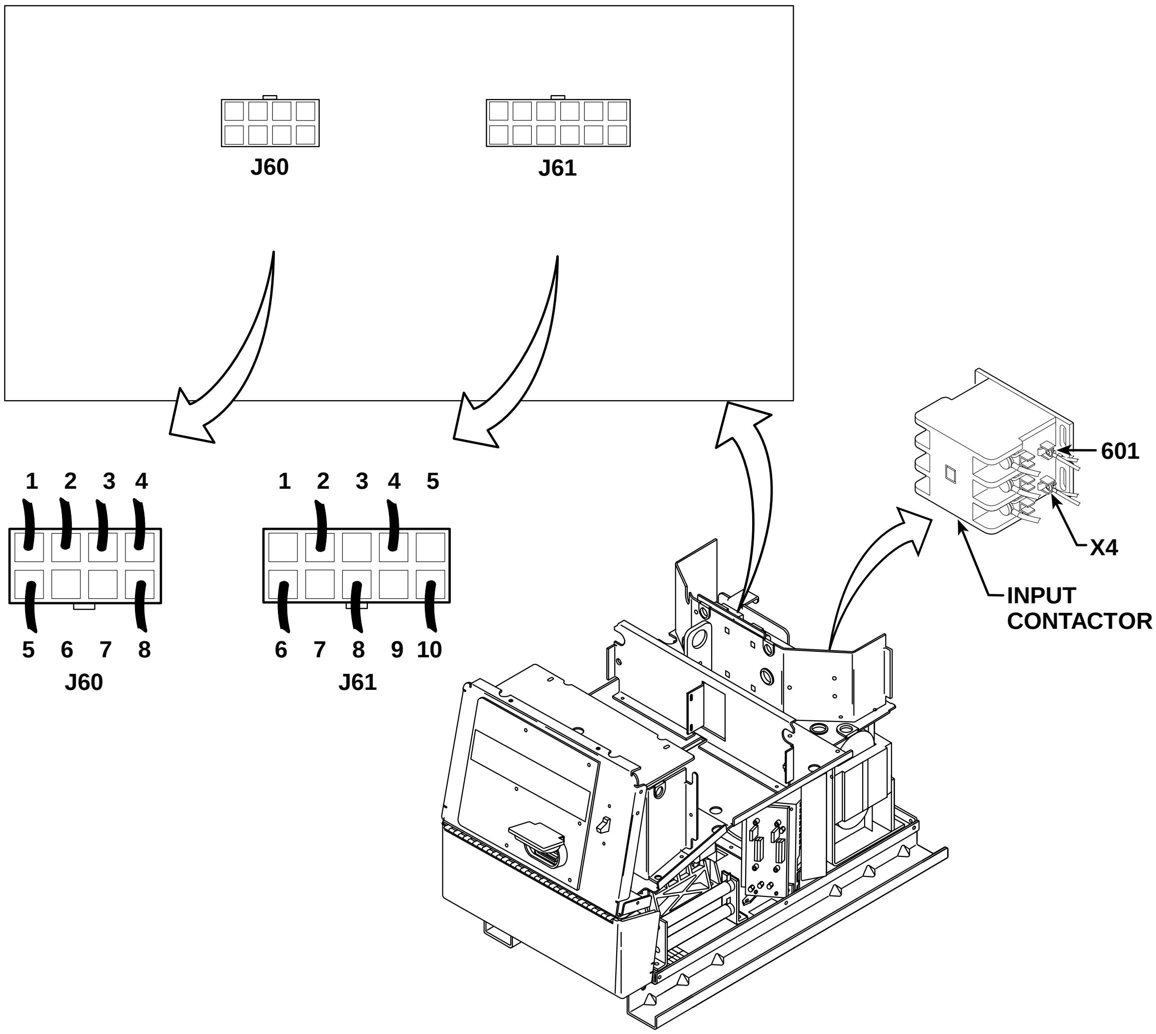
3/8” Nut driver
Volt-ohmmeter
Wiring Diagram

This procedure should take approximately 30 minutes to perform.

Return to Section TOC
Return to Master TOC
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Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

INPUT BOARD TEST *(CONTINUED)*

FIGURE F.9 – INPUT CONTACTOR CR1



TEST PROCEDURE

1. Remove input power to the Power Wave 455/R.
2. Using the 3/8” nut driver, remove the case top.
3. Remove lead X4 from the coil terminal of main input contactor CR1. Insulate lead X4. Refer to Figure F.9.
4. Carefully apply input power to the Power Wave 455/R.

WARNING



ELECTRIC SHOCK can kill.

High voltage is present when input power is applied to the machine.

5. Turn on the Power Wave 455/R. Carefully test for the correct voltages according to ***Table F.5.***

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

INPUT BOARD TEST *(CONTINUED)*

6. Remove input power to the Power Wave 455/R. If any of the voltages are low or not present, perform the ***Input Contactor Test***. If that checks out, the Input Board may by faulty.

7. Reconnect lead X4 to the main input contactor CR1 coil terminal.

8. Carefully apply the correct input voltage to the Power Wave 455/R.

⚠ WARNING



ELECTRIC SHOCK can kill.

High voltage is present when input power is applied to the machine.

9. Turn on the Power Wave 455/R. Check for the presence of 24 VAC from lead X4 to lead 601. See ***Figure F.9***. If the voltage is not present, perform the ***Auxiliary Transformer #1 Test.***

   This 24 VAC is the coil voltage for main input contactor CR1. It will normally be present approximately 12 seconds after input line switch (SW1) is activated.

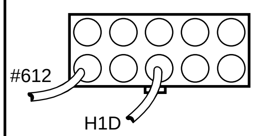
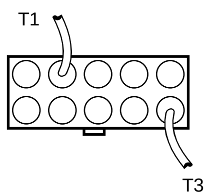
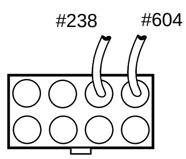
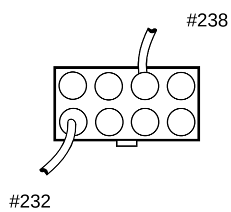
10. When the test is completed, remove input power from the Power Wave 455/R.

11. Install the case top using the 3/8” nut driver.

Return to Section TOC
Return to Master TOC
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Return to Section TOC
Return to Master TOC

INPUT BOARD TEST *(CONTINUED)*

TABLE F.5 – INPUT BOARD VOLTAGE CHECKS

TEST POINTS	LEAD NUMBERS	EXPECTED VOLTAGE READINGS	COMMENTS
PLUG J61 PIN 8 (H1D) TO PLUG J61 PIN 2 (612)	J61 	SAME AS INPUT VOLTAGE	Present when Input Switch SW1 is closed.
PLUG J61 PIN 10 (T3) TO PLUG J61 PIN 2 (T1)	J61 	A LITTLE LESS THAN INPUT VOLTAGE	This is Pre-Charge Voltage and will normally be present 6 seconds after activating Input Switch SW1. The Pre-Charge Voltage should remain for approximately 6 seconds and then be removed.
PLUG J60 PIN 3 (238) TO PLUG J60 PIN 4 (604)	J60 	13 – 15 VDC	This is the Coil Voltage for the Pre-Charge Relay. Normally this DC Voltage will be present 6 seconds after Input Switch SW1 is activated. This 13 - 15 VDC will remain for approximately 6 seconds and then be removed. The Relay is controlled by the Control Board. See the Wiring Diagram.
PLUG J60 PIN 3 (238) TO PLUG J60 PIN 5 (232)	J60 	13 – 15 VDC	This is the DC Coil Voltage for the Control Relay. Normally this DC Voltage will be present approximately 12 seconds after Input Switch SW1 is activated. The Relay is controlled by the Control PC Board. See the Wiring Diagram.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

STT CHOPPER BOARD TEST

⚠ WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-800-833-9353 (WELD).

TEST DESCRIPTION

This test will help determine if the STT Chopper Board is receiving the necessary voltages to function and if the related circuitry is correct.

MATERIALS NEEDED

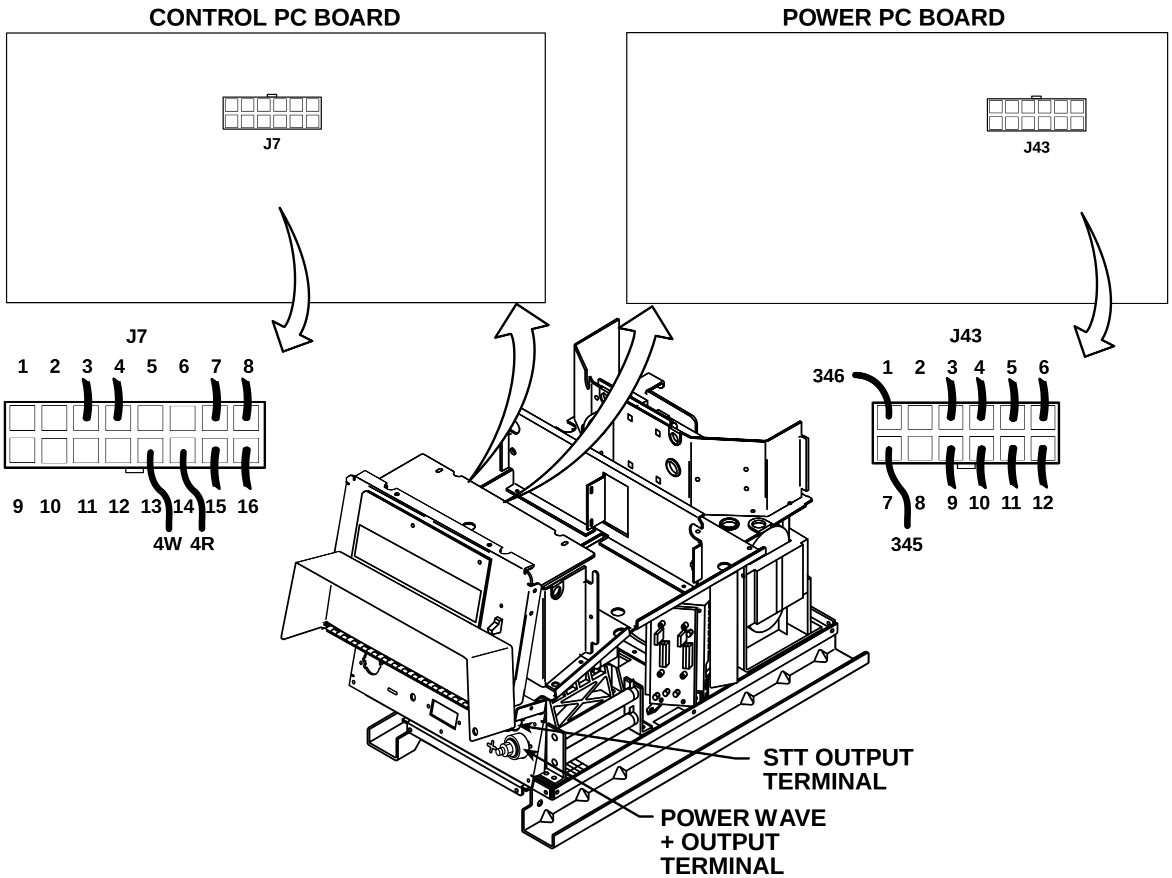
3/8” Nut driver
Volt-ohmmeter
Wiring Diagram

This procedure should take approximately 30 minutes to perform.

Return to Section TOC
Return to Master TOC

STT CHOPPER BOARD TEST *(CONTINUED)*

FIGURE F.10 – STT CHOPPER BOARD TEST DETAILS



TEST PROCEDURE

1. Remove input power to the Power Wave 455/R.
2. Using the 3/8" nut driver, remove the case top and the control box cover. See Figure F.10.
3. Perform the following resistance tests:

   + probe on the STT output terminal

   - probe on the Power Wave + output terminal

   The reading should be approximately 300,000 ohms

   + probe on the Power Wave + output terminal

   - probe on the STT output terminal

The reading should be less than 500 ohms

If both the polarity resistance tests are low, either the STT Chopper Module is faulty or diode D6 is shorted. See the Wiring Diagram.

Return to Section TOC
Return to Master TOC

STT CHOPPER BOARD TEST *(CONTINUED)*

4. Carefully apply input power to the Power Wave 455/R.

⚠ WARNING



ELECTRIC SHOCK can kill.

High voltage is present when input power is applied to the machine.

For steps 5 and 6, see ***Figure F.10.***

5. Turn on the Power Wave 455/R. Measure the voltage from Power Board plug J43 lead 345 pin 7 (+) to lead 346 pin 1 (-). The voltage should be approximately 20 VDC. If not correct, the Power Board may be faulty.

6. Measure the voltage from Control Board plug J7 lead 4W pin 13 (-) to lead 4R pin 14 (+). The voltage should be 4 – 5 VDC. This is the pulse width modulation signal to the STT Chopper Board. If not correct, the Control Board may be faulty.

7. When the test is completed, remove input power from the Power Wave 455/R.

8. Install the case top using the 3/8” nut driver.

POWER WAVE CURRENT TRANSDUCER TEST

WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-800-833-9353 (WELD).

TEST DESCRIPTION

This test will help determine if the Power Wave current transducer and associated wiring is functioning correctly.

MATERIALS NEEDED

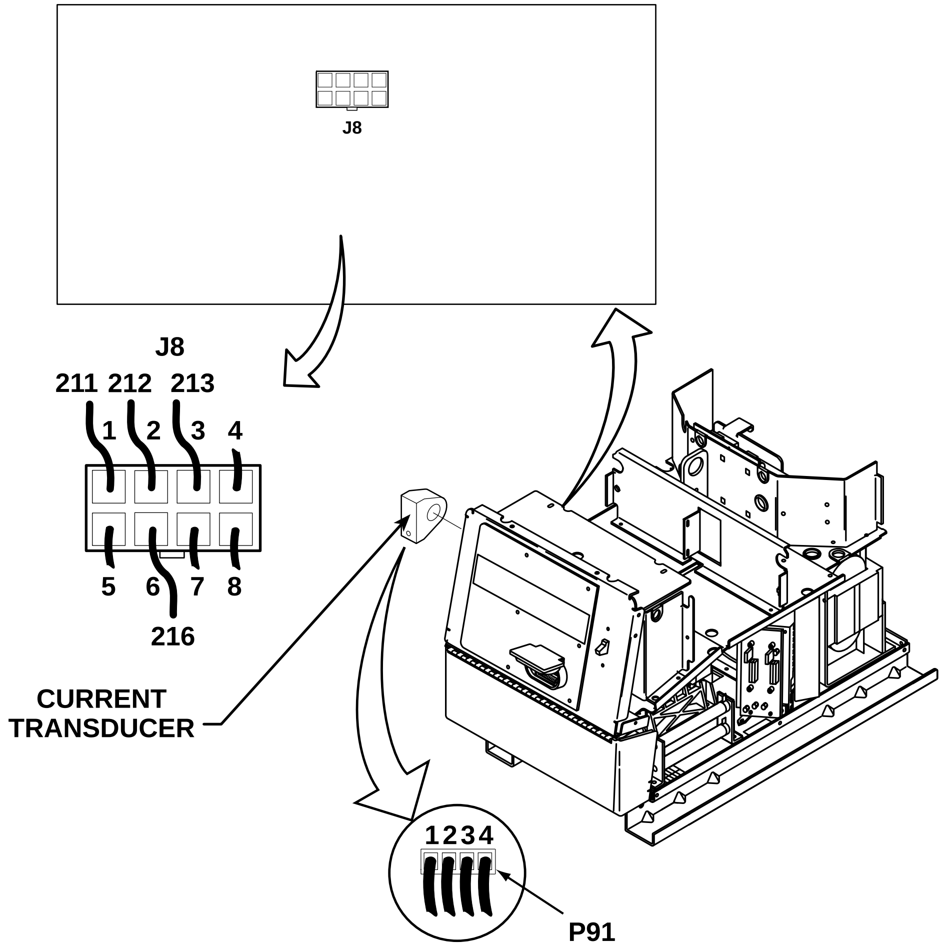
3/8” nut driver
Volt-Ohmmeter

This procedure should take approximately 25 minutes to perform.

Return to Section TOC
Return to Master TOC

POWER WAVE CURRENT TRANSDUCER TEST *(CONTINUED)*

FIGURE F.11 – POWER WAVE CURRENT TRANSDUCER TEST



TEST PROCEDURE

1. Remove input power to the Power Wave 455/R.
2. Using the 3/8" nut driver, remove the case top and the control box cover.
3. Locate the Power Wave current transducer leads at Control Board plug J8. See Figure F.11.
4. Carefully apply input power to the Power Wave 455/R.

⚠ WARNING

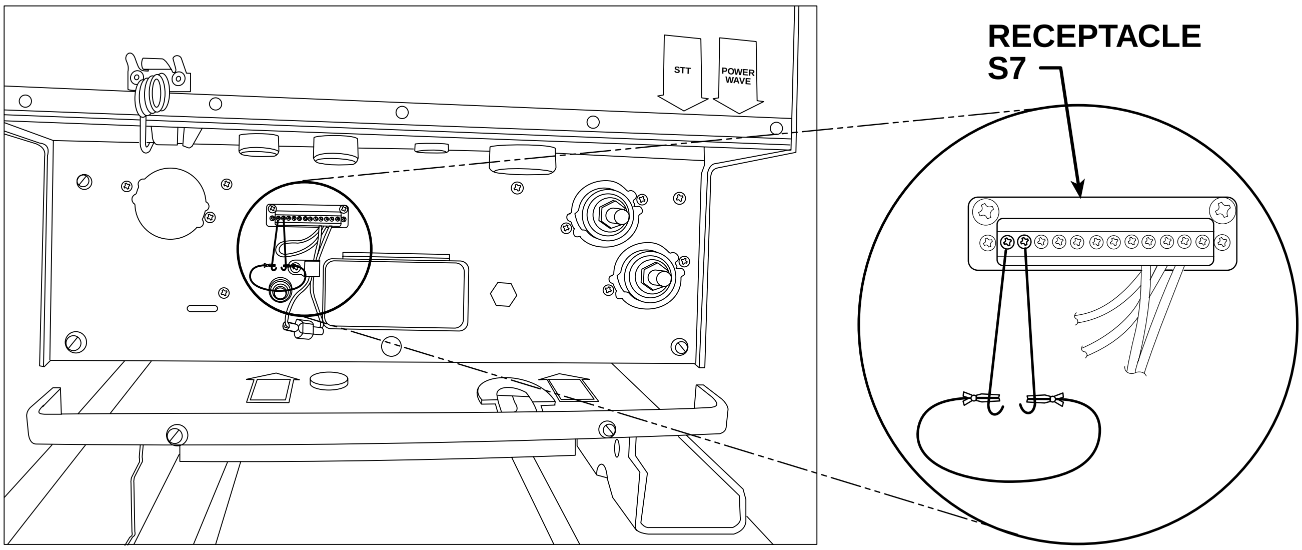
ELECTRIC SHOCK can kill.

High voltage is present when input power is applied to the machine.

Return to Section TOC
Return to Master TOC

POWER WAVE CURRENT TRANSDUCER TEST *(CONTINUED)*

FIGURE F.12 – RECEPTACLE S7 TRIGGERED



5. Turn on the Power Wave 455/R. Check for the correct DC supply voltage to the current transducer at plug J8. See ***Figure F.11.***

   A. Pin 2 (lead 212+) to pin 6 (lead 216-) should read +15 VDC.

   B. Pin 3 (lead 213-) to pin 6 (lead 216+) should read -15 VDC.

   If the DC supply voltages are not present, the control board may be faulty.

6. If both of the supply voltages are low or missing, check the associated leads between plug J8 and current transducer plug P91 and the Control Board.

NOTE: The machine can be triggered by jumpering pin 1 to pin 2 at receptacle S7. See Figure F.12.

7. With the Power Wave 455/R triggered, check the feedback voltage from the current transducer. The current feedback voltage can be read at plug J8 on the Control Board.

   A. Pin 1 (lead 211) to pin 6 (lead 216) should read 2.0 VDC (machine loaded to 250 amps).

Return to Section TOC
Return to Master TOC
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Return to Section TOC
Return to Master TOC

POWER WAVE CURRENT TRANSDUCER TEST *(CONTINUED)*

8. If for any reason the machine cannot be loaded to 250 amps, Table F.6 shows what feedback voltage is produced at various current loads.

9. If the correct supply voltages are applied to the current transducer, and with the machine loaded, the feedback voltage is missing or not correct, the current transducer may be faulty. Also make certain that lead 211 (plug J8 pin 1) has continuity (zero ohms) between the current transducer and the control board. See the Wiring Diagram.

10. Install the right side case cover using the 3/8” nut driver.

TABLE F.6 - CURRENT FEEDBACK AT VARIOUS OUTPUT LOADS

OUTPUT LOAD CURRENT	EXPECTED TRANSDUCER FEEDBACK VOLTAGE
500	4.0
450	3.6
400	3.2
350	2.8
300	2.4
250	2.0
200	1.6
150	1.2
100	0.8
50	0.4

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

STT CURRENT TRANSDUCER TEST

⚠ WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-800-833-9353 (WELD).

TEST DESCRIPTION

This test will help determine if the STT current transducer and associated wiring is functioning correctly.

MATERIALS NEEDED

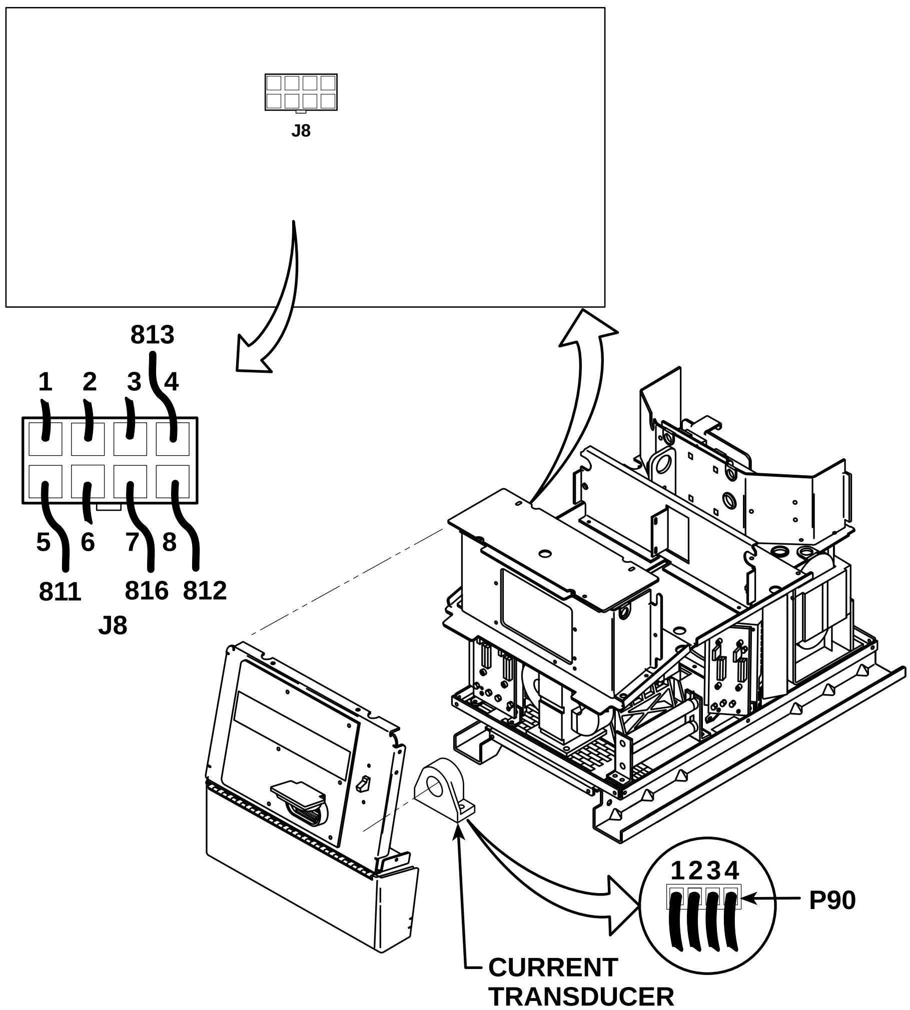
3/8” nut driver
Volt-Ohmmeter

This procedure should take approximately 25 minutes to perform.

Return to Section TOC
Return to Master TOC

STT CURRENT TRANSDUCER TEST *(CONTINUED)*

FIGURE F.13 – STT CURRENT TRANSDUCER TEST



TEST PROCEDURE

1. Remove input power to the Power Wave 455/R.
2. Using the 3/8” nut driver, remove the case top and the control box cover.
3. Locate the STT current transducer leads at Control Board plug J8. See Figure F.13.
4. Carefully apply input power to the Power Wave 455/R.

WARNING

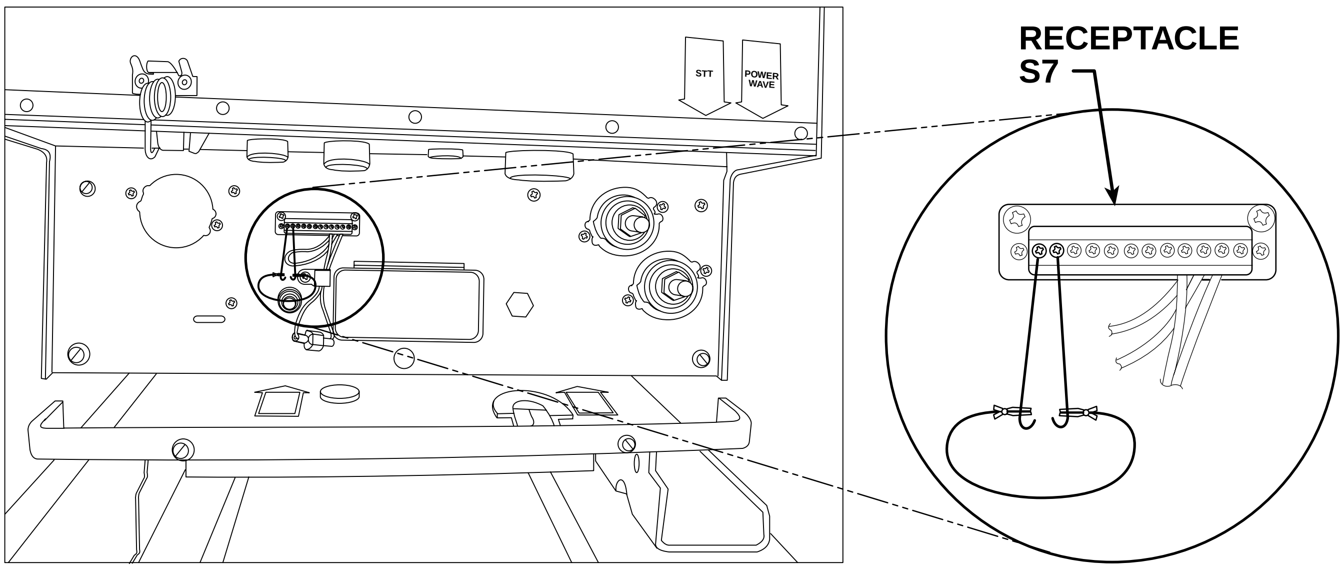
ELECTRIC SHOCK can kill.

High voltage is present when input power is applied to the machine.

Return to Section TOC
Return to Master TOC

STT CURRENT TRANSDUCER TEST *(CONTINUED)*

FIGURE F.14 – RECEPTACLE S7 TRIGGERED



5. Turn on the Power Wave 455/R. Check for the correct DC supply voltage to the current transducer at plug J8.

   A. Pin 8 (lead 812+) to pin 7 (lead 816-) should read +15 VDC.

   B. Pin 4 (lead 813-) to pin 7 (lead 816+) should read -15 VDC.

   If the DC supply voltages are not present, the control board may be faulty.

6. If both of the supply voltages are low or missing, check the associated leads between plug J8 and current transducer plug P90 and the Control Board.

NOTE: The machine can be triggered by jumpering pin 1 to pin 2 at receptacle S7. See Figure F. 14.

7. With the Power Wave 455/R triggered, check the feedback voltage from the current transducer. The current feedback voltage can be read at plug J8 on the Control Board.

   A. Pin 5 (lead 811) to pin 7 (lead 816) should read 2.0 VDC (machine loaded to 50 amps).

Return to Section TOC
Return to Master TOC

STT CURRENT TRANSDUCER TEST *(CONTINUED)*

8. If for any reason the machine cannot be loaded to 50 amps, ***Table F.6*** shows what feedback voltage is produced at various current loads.

9. If the correct supply voltages are applied to the current transducer, and with the machine loaded, the feedback voltage is missing or not correct, the current transducer may be faulty. Also make certain that lead 811 (plug J8 pin 5) has continuity (zero ohms) between the current transducer and the control board. See the Wiring Diagram.

10. Install the right side case cover using the 3/8” nut driver.

Return to Section TOC
Return to Master TOC
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Return to Master TOC

OUTPUT RECTIFIER TEST

WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-800-833-9353 (WELD).

TEST DESCRIPTION

The test will help determine if any of the output rectifiers are shorted.

MATERIALS NEEDED

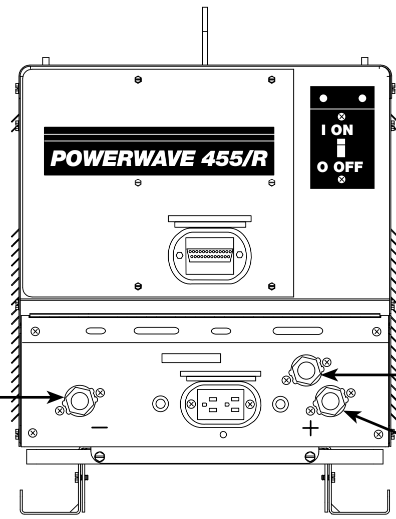
Analog Volt-Ohmmeter
3/8" Nut driver
5/16" Wrench

This procedure should take approximately 20 minutes to perform.

Return to Section TOC
Return to Master TOC
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Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

OUTPUT RECTIFIER TEST *(CONTINUED)*

FIGURE F.15 – OUTPUT RECTIFIER TEST



TEST PROCEDURE

1. Remove main input supply power to the Power Wave 455/R.
2. Remove the case top and sides and perform the ***Input Filter Capacitor Discharge*** procedure.
3. Using the 5/16" wrench, remove and insulate lead 202A from the negative output terminal.
4. Remove any output load that may be connected to the Power Wave 455/R.
5. With the analog ohmmeter, measure the resistance between the positive and negative output terminals (NOT the STT terminal). Refer to Figure F.15.

IMPORTANT: The positive (+) meter probe must be attached to the positive (+) output terminal and the negative (-) meter probe must be attached to the negative (-) output terminal.

6. If the reading is more than 200 ohms, the output rectifier modules are not shorted. If the reading is less than 200 ohms, one or more of the rectifier modules are shorted. Refer to the ***Output Rectifier Module Replacement*** procedure.
7. Reconnect lead 202A to the negative output terminal.
8. Replace the case top and sides.

AUXILIARY TRANSFORMER NO. 1 TEST

WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-800-833-9353 (WELD).

TEST DESCRIPTION

This test will determine if the correct voltage is being applied to the primary of Auxiliary Transformer No. 1 and also if the correct voltages are being induced on the secondary windings of the transformer.

MATERIALS NEEDED

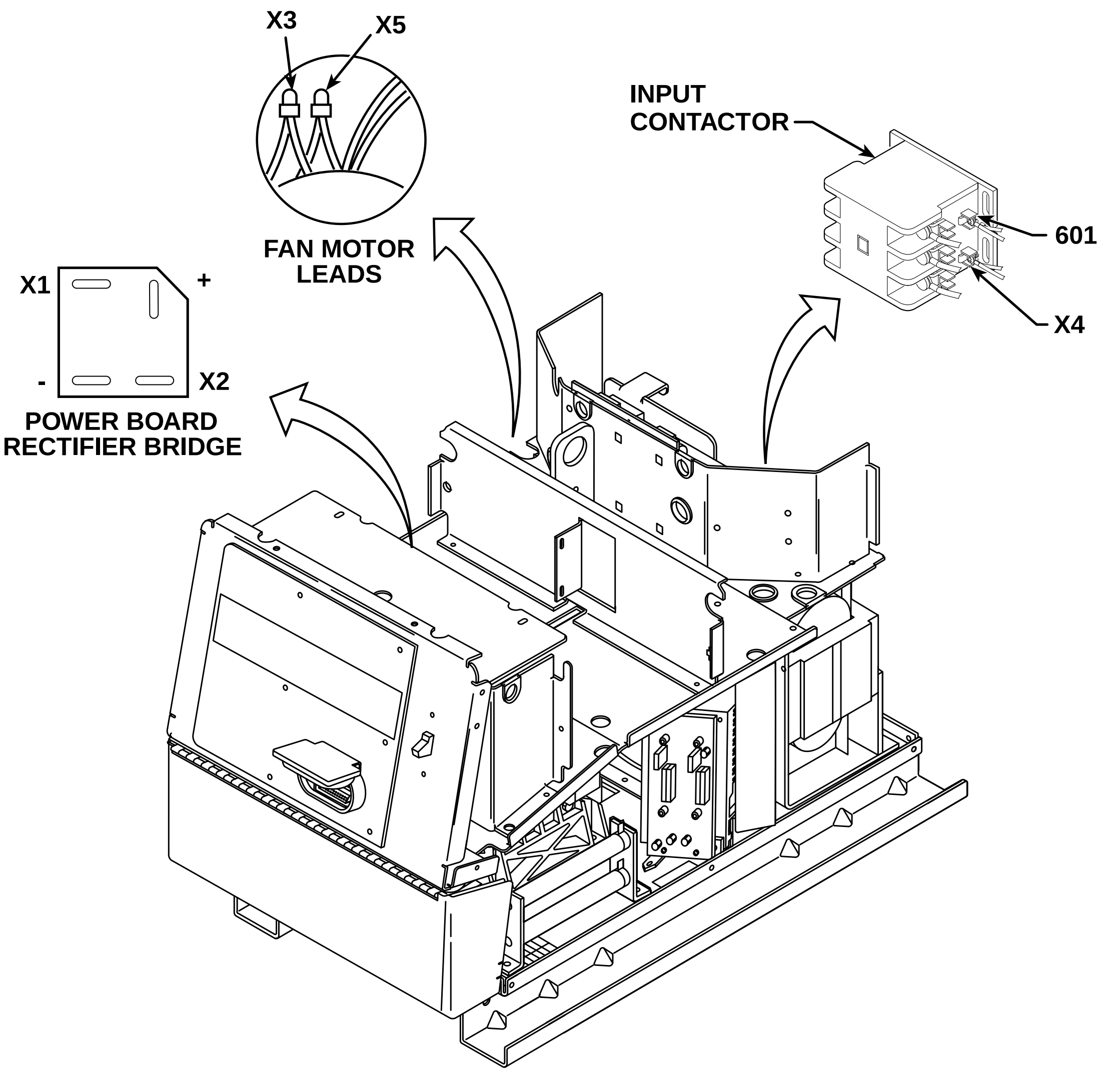
Volt-ohmmeter (Multimeter)
3/8" Nut driver
Wiring Diagram

This procedure should take approximately 30 minutes to perform.

Return to Section TOC
Return to Master TOC
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Return to Master TOC
Return to Section TOC
Return to Master TOC

AUXILIARY TRANSFORMER NO. 1 TEST *(CONTINUED)*

FIGURE F.16 – AUXILIARY TRANSFORMER NO. 1 TEST



TEST PROCEDURE

1. Remove the main input power to the Power Wave 455/R machine.
2. Using the 3/8” nut driver, remove the case top and sides.
3. Perform the ***Capacitor Discharge*** procedure.
4. Locate secondary leads X1 and X2 (at power board rectifier bridge). Refer to Figure F.16.
5. Locate secondary leads X3 and X5 (fan motor leads).
6. Locate secondary lead X4 (at main contactor).

Return to Section TOC
Return to Master TOC

AUXILIARY TRANSFORMER NO. 1 TEST *(CONTINUED)*

TABLE F.7 – SECONDARY VOLTAGES

LEAD IDENTIFICATION	NORMAL EXPECTED VOLTAGE
X1 to X2	52 VAC
X3 to X5	115 VAC
X3 to X4	24 VAC

7. Carefully apply the correct input voltage to the Power Wave 455/R.

⚠ WARNING



ELECTRIC SHOCK can kill.

High voltage is present at primary of the Auxiliary Transformer.

8. Check for the correct secondary voltages according to Table F.7.

NOTE: The secondary voltages will vary if the input line voltage varies.

9. If the correct secondary voltages are present, the T1 auxiliary transformer is functioning properly. If any of the secondary voltages are missing or low, check to make certain the primary is configured correctly for the input voltage applied. See the Wiring Diagram.

10. If the correct input voltage is applied to the primary, and the secondary voltage(s) are not correct, the T1 transformer may be faulty.

11. Replace any cables ties and insulation removed earlier.

12. Install the case sides and top using the 3/8" nut driver.

Return to Section TOC
Return to Master TOC
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Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

AUXILIARY TRANSFORMER NO. 2 TEST

WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-800-833-9353 (WELD).

TEST DESCRIPTION

This test will determine if the correct voltage is being applied to the primary of Auxiliary Transformer No. 2 and also if the correct voltages are being induced on the secondary windings of the transformer.

MATERIALS NEEDED

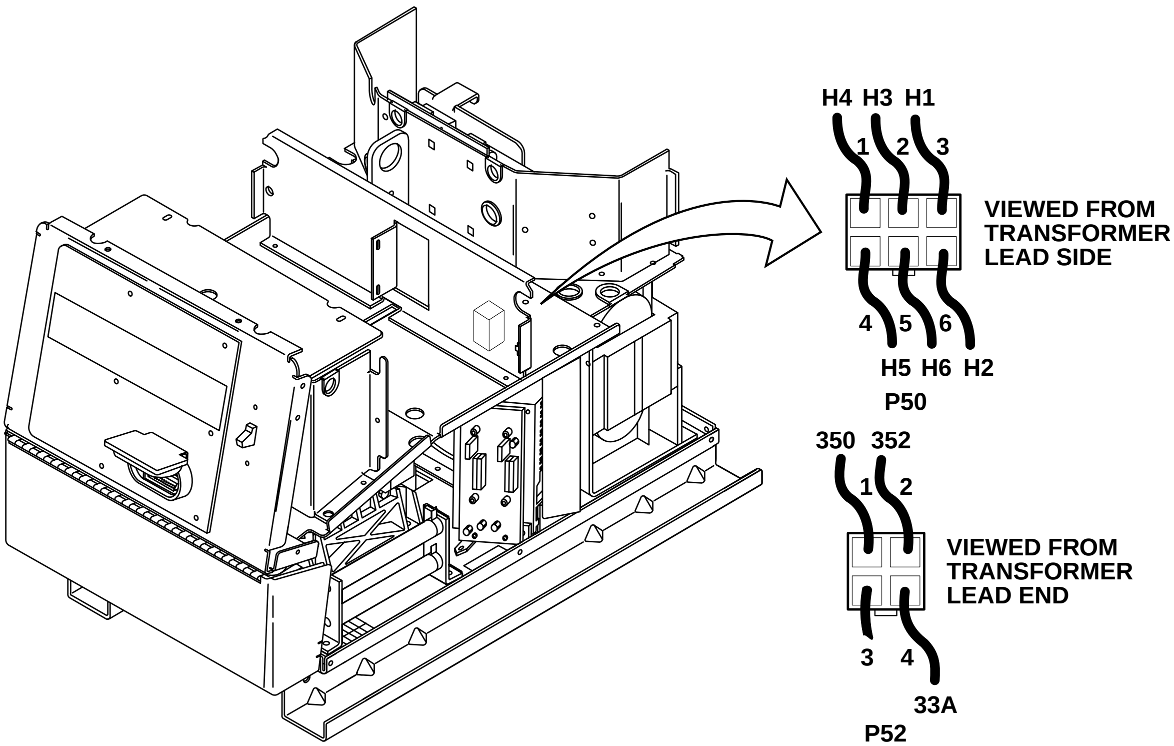
Volt-ohmmeter (Multimeter)
3/8" Nut driver
Wiring Diagram

This procedure should take approximately 25 minutes to perform.

Return to Section TOC
Return to Master TOC
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Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

AUXILIARY TRANSFORMER NO. 2 TEST *(CONTINUED)*

FIGURE F.17 – AUXILIARY TRANSFORMER NO. 2 TEST



TEST PROCEDURE

1. Remove the main input power to the Power Wave 455/R machine.
2. Remove any load that may be connected to the 115 VAC receptacle.
3. Using the 3/8” nut driver, remove the case top.
4. Locate plugs P52 and P50 at the Auxiliary Transformer No. 2. Refer to Figure F.17.
5. Carefully apply the correct input power.

WARNING



ELECTRIC SHOCK can kill.

High voltage is present at both plugs.

6. Check for 115 VAC at plug P52 pins 1 and 4 (leads 350 to 33A). Check for 230 VAC at plug P52 pins 1 and 2 (leads 350 to 352).
7. If 115 VAC and 230 VAC are present, Auxiliary Transformer No. 2 is good.
8. If 115 is not present between pins 1 and 4, and 230 VAC is not present between pins 1 and 2, check the associated leads and plugs for loose or faulty connections.
9. Carefully test for the correct AC input voltage applied to the primary windings at plug P50. See the Wiring Diagram.
10. If the correct AC input voltage is applied to the primary of the Auxiliary Transformer No. 2 and the secondary voltage is NOT correct, the transformer may be faulty. Replace.
11. Replace any cables ties and insulation removed earlier.
12. Install the case top using the 3/8” nut dri-

Return to Section TOC
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Return to Master TOC

INPUT RECTIFIER REMOVAL AND REPLACEMENT

WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-800-833-9353 (WELD).

DESCRIPTION

This procedure will aid the technician in the removal and replacement of the input rectifier module.

MATERIALS NEEDED

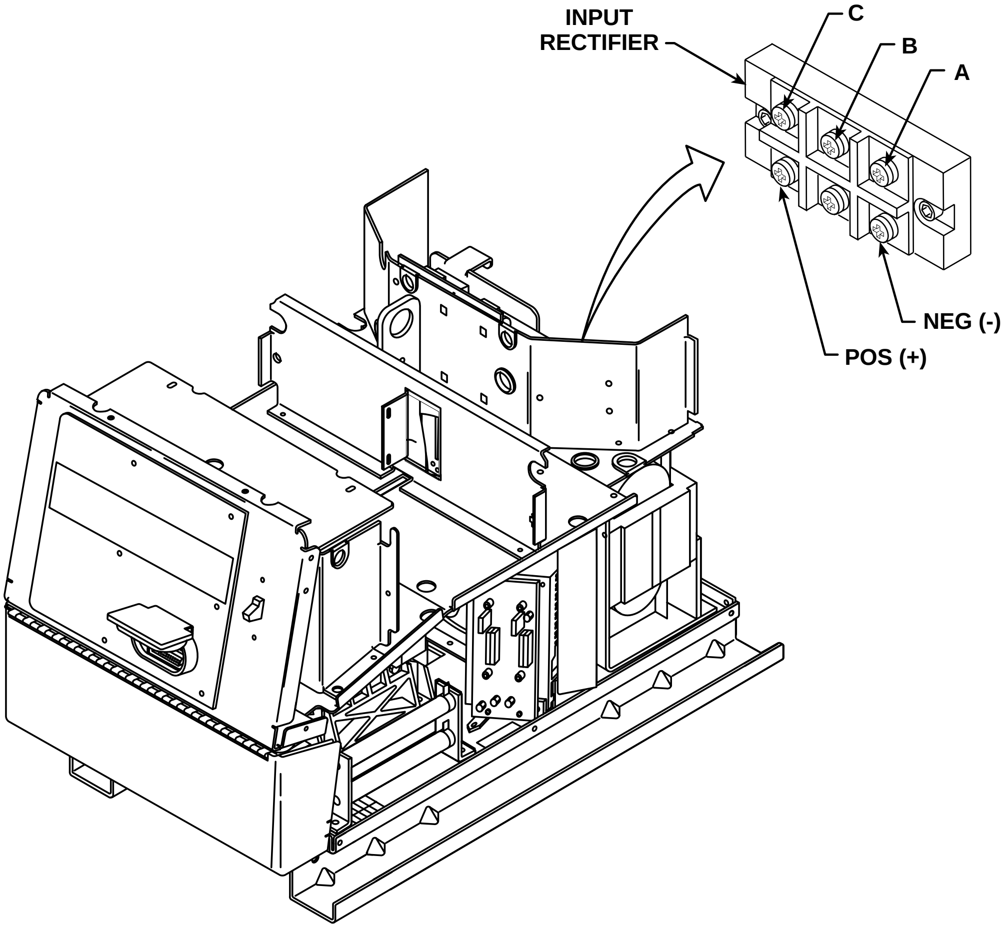
3/8" nut driver
3/16" Allen wrench
Phillips head screwdriver

This procedure should take approximately 15 minutes to perform.

Return to Section TOC
Return to Master TOC
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Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

INPUT RECTIFIER REMOVAL AND REPLACEMENT *(CONTINUED)*

FIGURE F.18 – INPUT RECTIFIER REMOVAL AND REPLACEMENT



REMOVAL PROCEDURE

1. Remove input power to the Power Wave 455/R.
2. Using the 3/8" nut driver, remove the case top, sides, and input access panel.
3. Perform the ***Capacitor Discharge*** procedure.
4. Locate and remove the RTV sealant from the input rectifier connection terminals. See Figure F. 18.
5. Label and, using the phillips head screwdriver, carefully remove the five leads from the input rectifier terminals. Note placement for reassembly. See Figure F.18.
6. Using the 3/16" allen wrench, remove the two mounting screws and washers from the rectifier module.
7. Carefully remove the input rectifier module.

REPLACEMENT PROCEDURE

1. Clean heat sink surfaces.
2. Apply an even coating of joint compound (Penetrox A-13) to both the heat sink and module mounting surfaces. The joint compound should be 0.002 - 0.005 in. thick per surface.
3. Mount the module to the heat sink and evenly torque the mounting screws (with washers) to 44 in/lbs.
4. Assemble the leads to the correct module terminals and torque to 26 in/lbs. See Figure F.18.
5. Apply RTV sealant to the rectifier connection terminals.
6. Install the case top, sides, and input access panel using the 3/8" nut driver.

Return to Section TOC
Return to Master TOC

INPUT CONTACTOR REMOVAL AND REPLACEMENT

WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-800-833-9353 (WELD).

TEST DESCRIPTION

This procedure will aid the technician in the removal and replacement of the input contactor.

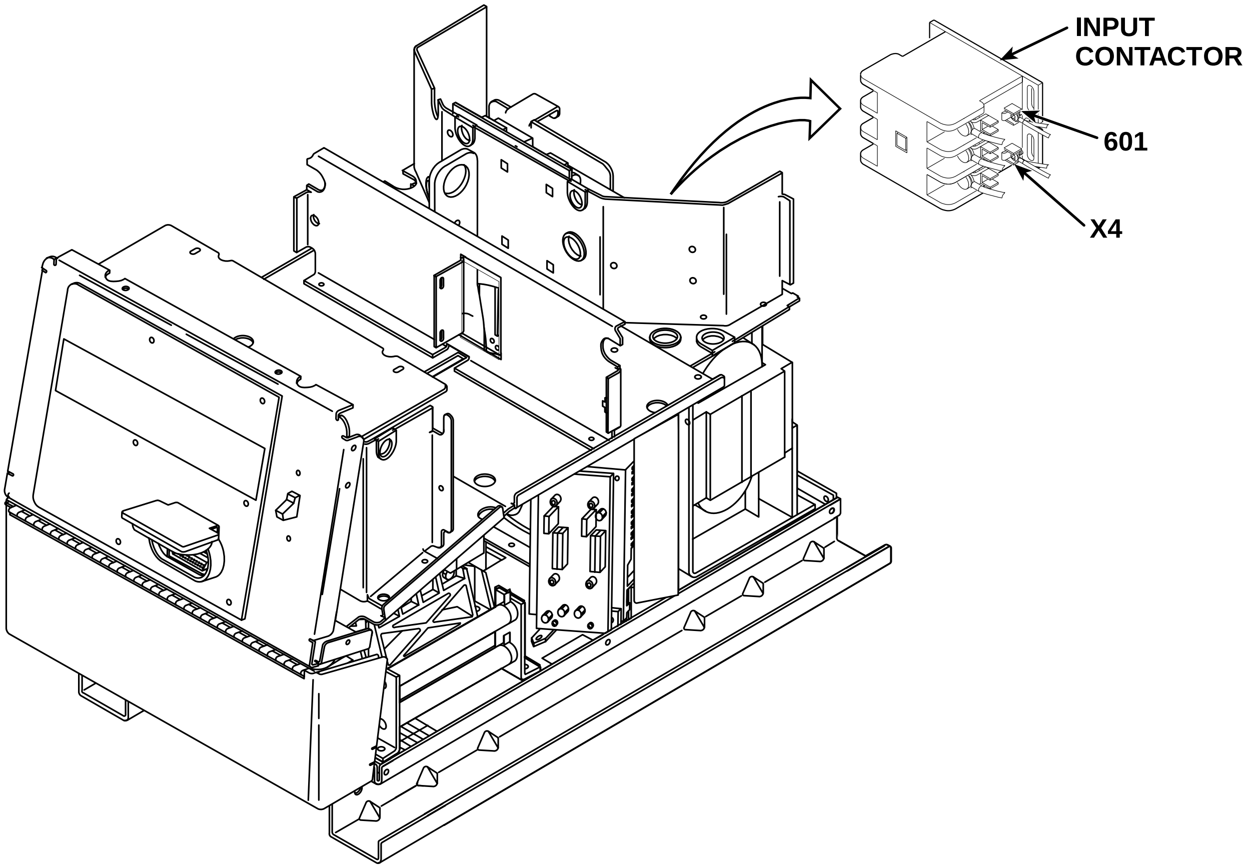
MATERIALS NEEDED

3/8" nut driver
5/16" nut driver
Phillips head screwdriver

This procedure should take approximately 15 minutes to perform.

INPUT CONTACTOR REMOVAL AND REPLACEMENT *(CONTINUED)*

FIGURE F.19 – INPUT CONTACTOR REMOVAL AND REPLACEMENT



REMOVAL PROCEDURE

1. Remove input power to the Power Wave 455/R.
2. Using the 3/8" nut driver, remove the case top, sides, and input access panel.
3. Perform the ***Capacitor Discharge*** procedure
4. Locate the input contactor. Label and, using the phillips head screwdriver, carefully remove the leads from the input contactor terminals. Note placement for reassembly. See Figure F.19.
5. With the 5/16" nut driver, remove the three mounting screws. See Figure F.19.
6. Carefully remove the input contactor.

REPLACEMENT PROCEDURE

1. Mount the contactor and tighten the mounting screws.
2. Assemble the leads to the correct terminals. See ***Figure F.18.***
3. Install the case top, sides, and input access panel using the 3/8" nut driver.

Return to Section TOC
Return to Master TOC
Return to Section TOC
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Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

AUXILIARY TRANSFORMER NO. 1 REMOVAL AND REPLACEMENT PROCEDURE

WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-800-833-9353 (WELD).

DESCRIPTION

This procedure will aid the technician in the removal and replacement of auxiliary transformer No. 1.

MATERIALS NEEDED

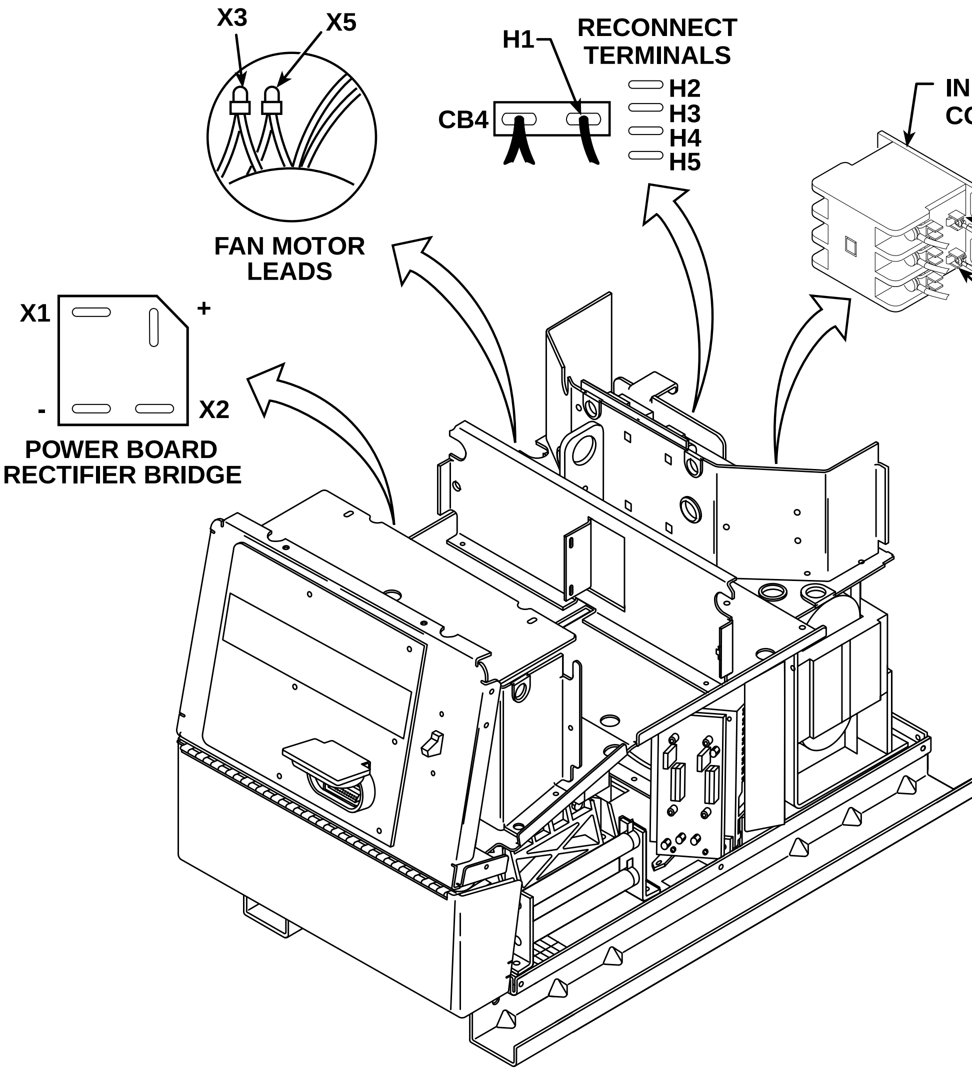
3/8" Nut driver
Wire cutters
Wire splicer or soldering equipment

This procedure should take approximately 25 minutes to perform.

Return to Section TOC
Return to Master TOC
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Return to Master TOC
Return to Section TOC
Return to Master TOC

AUXILIARY TRANSFORMER NO. 1 REMOVAL AND REPLACEMENT PROCEDURE *(CONTINUED)*

FIGURE F.20 – AUXILIARY TRANSFORMER NO. 1 REMOVAL AND REPLACEMENT



REMOVAL PROCEDURE

1. Remove input power to the Power Wave 455/R.
2. Using the 3/8” nut driver, remove the case top, sides and input access panel.
3. Perform the ***Capacitor Discharge*** procedure.
4. Using the 3/8” nut driver, remove the case back.
5. Remove lead X4 from the input contactor coil terminal.

AUXILIARY TRANSFORMER NO. 1 REMOVAL AND REPLACEMENT PROCEDURE *(CONTINUED)*

6. Remove leads X1 and X2 from the power board rectifier bridge. Refer to ***Figure F.20***.
7. Cut X3 and X5 from the fan motor leads. Leave enough lead length to splice in the new transformer leads.
8. Cut the X3 lead that is connected to the input board. Leave enough lead length to splice in the new transformer lead.
9. Locate, label, and remove primary lead H1 from circuit breaker CB4.
10. Label and remove primary leads H2, H3, H4, and H5 from the reconnect terminals on the reconnect panel. Note lead placement for reassembly.
11. Cut any necessary cable ties and clear the leads.
12. Using the 3/8" nut driver, remove the two mounting screws that hold the transformer to the fan baffle and the machine base.
13. Carefully remove the transformer from the Power Wave 455/R.

REPLACEMENT PROCEDURE

1. Carefully place the transformer into the Power Wave 455/R.
2. Install the two mounting screws that hold the transformer to the fan baffle and the machine base using the 3/8" nut driver.
3. Install the primary leads H2, H3, H4, and H5 to the reconnect terminals on the reconnect panel.
4. Connect primary lead H1 to circuit breaker CB4.
5. Splice the new transformer lead with the X3 lead connected to the input board.
6. Splice the new transformer fan leads to the fan motor leads X3 and X5.
7. Connect lead X4 to the main contactor coil terminal.
8. Connect leads X1 and X2 to the power board rectifier bridge.
9. Reposition any wire leads and install cable ties as necessary.
10. Install the case back using the 3/8" nut driver.
11. Install the case top, sides, and input access panel using the 3/8" nut driver.

Return to Section TOC
Return to Master TOC

AUXILIARY TRANSFORMER NO. 2 REMOVAL AND REPLACEMENT PROCEDURE

⚠ WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-800-833-9353 (WELD).

TEST DESCRIPTION

This procedure will aid the technician in the removal and replacement of auxiliary transformer No. 2.

MATERIALS NEEDED

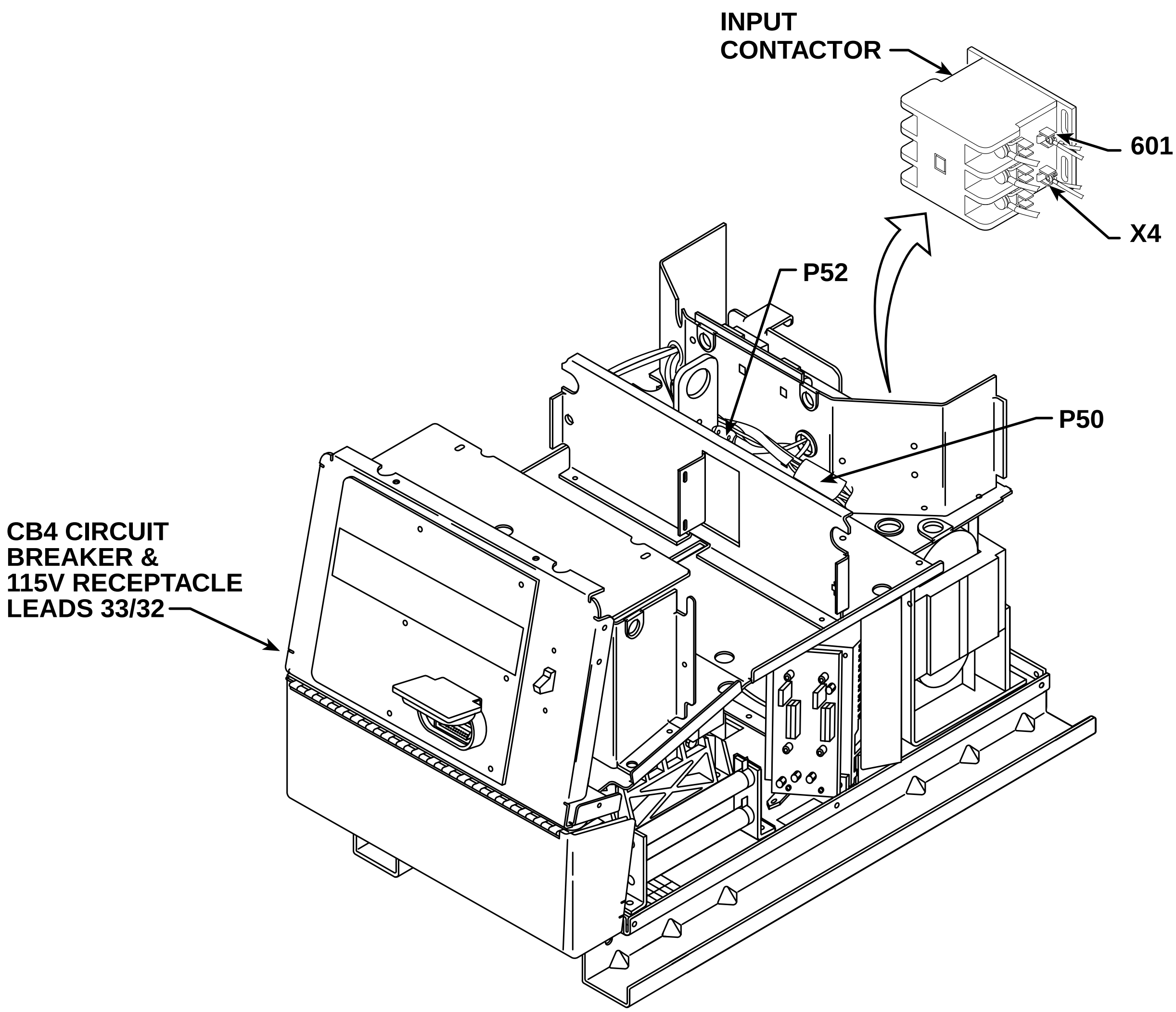
3/8” Nut driver
Wire cutters

This procedure should take approximately 25 minutes to perform.

Return to Section TOC
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Return to Master TOC
Return to Section TOC
Return to Master TOC

AUXILIARY TRANSFORMER NO. 2 REMOVAL AND REPLACEMENT PROCEDURE *(CONTINUED)*

FIGURE F.21 – AUXILIARY TRANSFORMER NO. 2 REMOVAL AND REPLACEMENT



REMOVAL PROCEDURE

1. Remove input power to the Power Wave 455/R.
2. Using the 3/8” nut driver, remove the case top, sides and input access panel.
3. Perform the ***Capacitor Discharge*** procedure.
4. Using the 3/8” nut driver, remove the case back.
5. Disconnect plugs P50 and P52.
6. Disconnect leads 33 and 32 to circuit breaker CB2 and the 115 V receptacle.
7. Using the 3/8” nut driver, remove the two transformer mounting screws.

AUXILIARY TRANSFORMER NO. 2 REMOVAL AND REPLACEMENT PROCEDURE *(CONTINUED)*

REPLACEMENT PROCEDURE

1. Carefully place the transformer into the Power Wave 455/R.
2. Install the two mounting screws that hold the transformer to the machine base using the 3/8" nut driver.
3. Connect leads 33 and 32 to circuit breaker CB4 and the 115 V receptacle.
4. Connect plugs P50 and P52.
5. Reposition any wire leads and install cable ties as necessary.
6. Install the case back using the 3/8" nut driver.
7. Install the case top, sides, and input access panel using the 3/8" nut driver.

Return to Section TOC Return to Master TOC
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Return to Section TOC Return to Master TOC

CONTROL, FEED HEAD, OR VOLTAGE SENSE PC BOARD REMOVAL AND REPLACEMENT

WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-800-833-9353 (WELD).

DESCRIPTION

This procedure will aid the technician in the removal and replacement of either the Control Board the Feed Head Board, or the Voltage Sense Board.

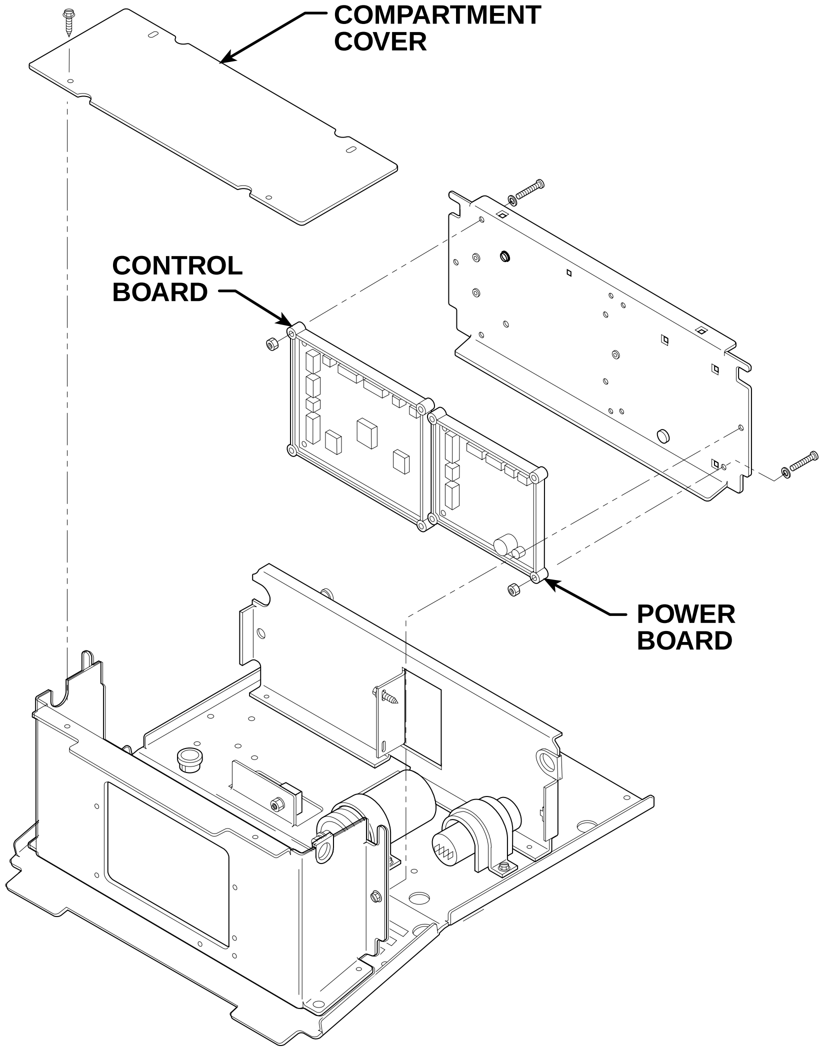
MATERIALS NEEDED

3/8" Nut driver
Anti-static wrist strap

This procedure should take approximately 15 minutes to perform.

CONTROL, FEED HEAD, OR VOLTAGE SENSE PC BOARD REMOVAL AND REPLACEMENT *(CONTINUED)*

FIGURE F.22 – CONTROL OR FEED HEAD BOARD REMOVAL AND REPLACEMENT



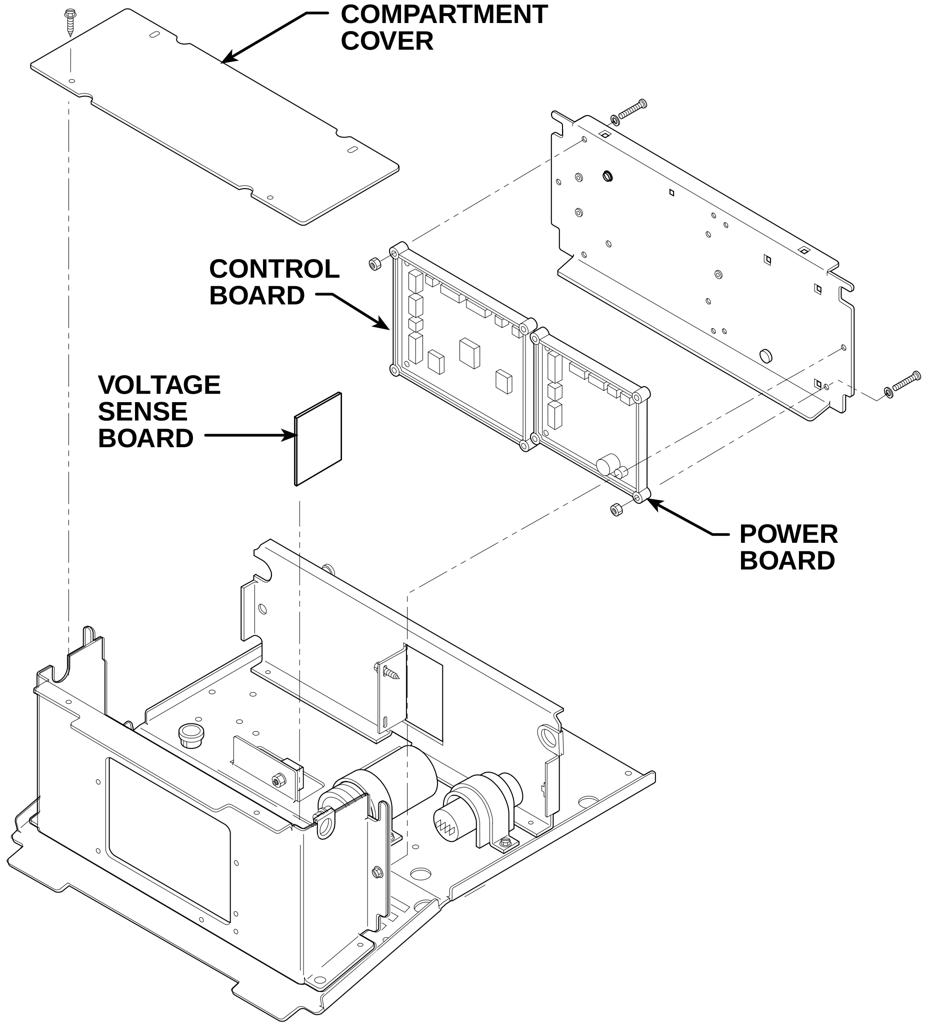
REMOVAL PROCEDURE

1. Remove input power to the Power Wave 455/R.
2. Using the 3/8" nut driver, remove the case top and sides.
3. Perform the ***Capacitor Discharge*** procedure.
4. Observe all static electricity precautions.
5. Using the 3/8" nut driver, remove the PC board compartment cover. Refer to Figure F.22.
6. Using the 3/8" nut driver, remove the two screws holding the rear of the Control Box in place.
7. Clear the leads in the sleeving and the grommets on the sides of the control box.
8. Label and remove the molex plugs from the Control Board and the Feed Head Board.

Return to Section TOC
Return to Master TOC
Return to Section TOC
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Return to Master TOC

CONTROL, FEED HEAD, OR VOLTAGE SENSE PC BOARD REMOVAL AND REPLACEMENT *(CONTINUED)*

FIGURE F.23 – VOLTAGE SENSE BOARD REMOVAL AND REPLACEMENT



9. Tilt back the rear of the control box to access the PC board mounting nuts. Using the 3/8" nut driver, remove the self-locking mounting nuts from the Control and Feed Head Boards. Carefully remove the boards.

10. Remove plugs J1 and J2 from the Voltage Sense Board. See Figure F.23.

11. Using the needle-nose pliers, carefully pinch the three plastic standoffs. Remove the Voltage Sense Board.

REPLACEMENT PROCEDURE

1. Install either the Control or the Feed Head Board to the back of the control box with the self-locking nuts. Use the 3/8" nut driver.

2. Connect the molex plugs to the Control Board and the Feed Head Board. Be sure the lead harnesses are securely and properly positioned.

3. Secure the rear of the control box in place using two screws and the 3/8" nut driver.

Return to Section TOC
Return to Master TOC
Return to Section TOC
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CONTROL, FEED HEAD, OR VOLTAGE SENSE PC BOARD REMOVAL AND REPLACEMENT *(CONTINUED)*

3. Secure the rear of the control box in place using two screws and the 3/8” nut driver.
4. Press the Voltage Sense Board onto its standoffs. Make sure the board snaps into place on all three standoffs.
5. Connect the two molex plugs to the Voltage Sense Board.
6. Install the PC board compartment cover using the 3/8” nut driver.
7. Install the case top and sides using the 3/8” nut driver.

Return to Section TOC
Return to Master TOC

GATEWAY PC BOARD REMOVAL AND REPLACEMENT

WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-800-833-9353 (WELD).

DESCRIPTION

This procedure will aid the technician in the removal and replacement of the Gateway PC Board.

MATERIALS NEEDED

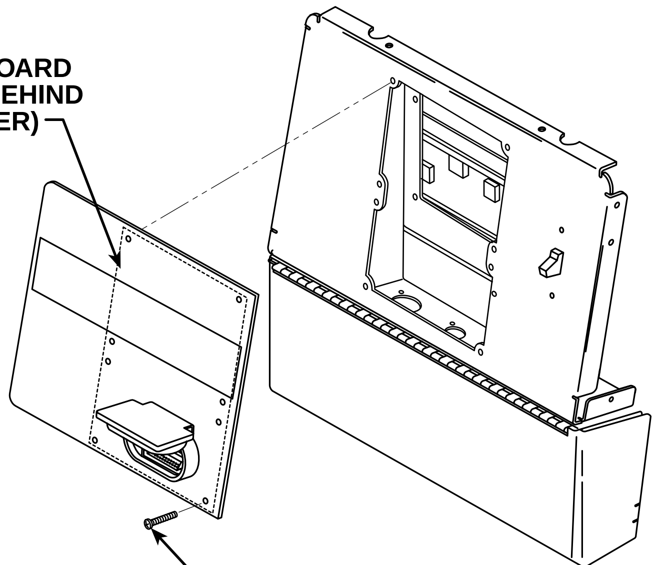
Phillips head screw driver
3/8” Nut driver
Anti-static wrist strap

This procedure should take approximately 15 minutes to perform.

Return to Section TOC
Return to Master TOC

GATEWAY PC BOARD REMOVAL AND REPLACEMENT *(CONTINUED)*

FIGURE F.24 – GATEWAY BOARD REMOVAL AND REPLACEMENT



REMOVAL PROCEDURE

1. Remove input power to the Power Wave 455/R.
2. Using the phillips head screw driver, remove the six screws from the case front cover. Tilt open the cover and support it. See Figure F.24.
3. Observe all static electricity precautions.
4. Label and remove the four molex plugs from the Gateway Board.
5. Using the 3/8" nut driver, remove the self-locking mounting nuts from the Gateway Board. Carefully remove the board. Refer to Figure F.24.

REPLACEMENT PROCEDURE

1. Install the Gateway Board to the case front cover with the self-locking nuts. Use the 3/8" nut driver.
2. Connect the four molex plugs to the Gateway Board.
3. Using the phillips head screw driver, attach the cover to the case front.

STT CURRENT TRANSDUCER REMOVAL AND REPLACEMENT

⚠ WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-800-833-9353 (WELD).

DESCRIPTION

This procedure will aid the technician in the removal and replacement of the STT Current Transducer.

MATERIALS NEEDED

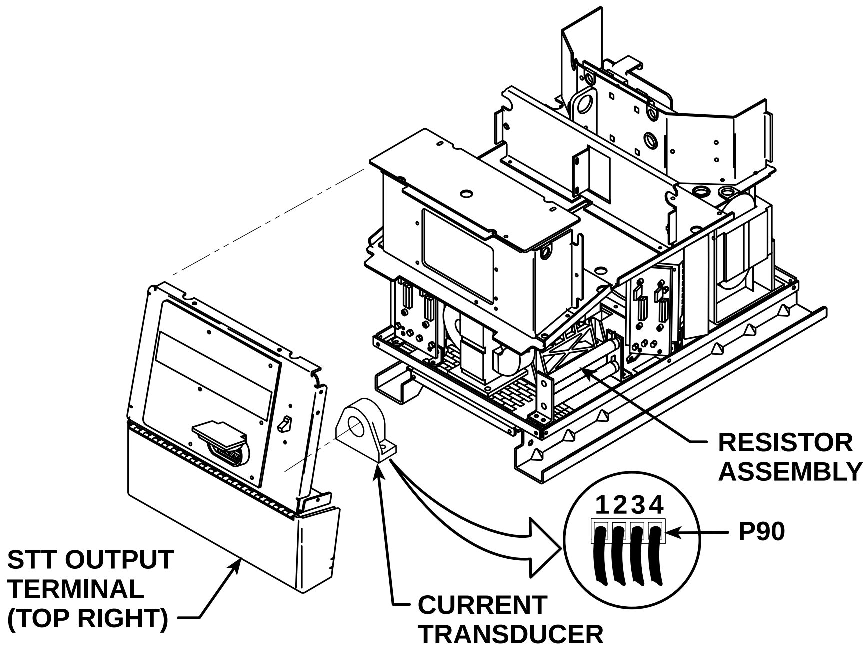
3/8” Nut driver
5/16” Open end wrench
5/16” Socket wrench with extension
Universal adapter
3/4” Wrench
Phillips head screw driver
Wire cutters
Wiring Diagram

This procedure should take approximately 25 minutes to perform.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

STT CURRENT TRANSDUCER REMOVAL AND PLACEMENT *(CONTINUED)*

FIGURE F.25 – STT CURRENT TRANSDUCER REMOVAL AND REPLACEMENT PROCEDURE



REMOVAL PROCEDURE

1. Remove input power to the Power Wave 455/R.
2. Using the 3/8" nut driver, remove the case top and right side.
3. Perform the ***Capacitor Discharge*** procedure.
4. Using the wire cutters, cut all cable ties to the transducer lead harness. Unplug the harness and swing it aside.
5. Label and remove the leads to the resistor assembly. See Figure F.25. Using the 5/16" socket wrench, extension and universal adapter, remove the resistor assembly. It may be necessary to remove the glastic high voltage protection shield. (Use the 3/8" nut driver.) It may also be necessary to use a 5/16" open end wrench to remove the inside screws. Carefully swing the resistor assembly aside.

Return to Section TOC
Return to Master TOC

STT CURRENT TRANSDUCER REMOVAL AND REPLACEMENT *(CONTINUED)*

6. With the 5/16" open end wrench, remove the small screw from the STT output terminal. Label and remove the small leads. See the Wiring Diagram.
7. Using the 3/4" wrench, remove the bolt, lock washer and flat washer from the STT output terminal. Remove the double heavy output leads. Cut any necessary cable ties.
8. Using the phillips head screw driver, remove the screws and lock washers that hold the transducer to the front panel.
9. Remove the STT current transducer, carefully feeding the output leads through it.
10. Remove the standoffs from the transducer and save them for reassembly with the new transducer.

REPLACEMENT PROCEDURE

1. Attach the standoffs to the transducer.
2. Position the transducer on the back of the front panel and attach it with the two phillips screws and lock washers. Feed the output leads through the transducer.
3. Attach the double heavy leads to the STT output terminal with the 3/4" bolt, lock washer and flat washer.
4. Attach the small leads to the STT output terminal with the 5/16" screw.
5. Install the resistor assembly using the 5/16" socket wrench, extension and universal adapter. Install the glastic high voltage protection shield with the 3/8" nut driver.
6. Replace all cable ties cut during removal.
7. Install the case top and right side using the 3/8" nut driver.

POWER WAVE CURRENT TRANSDUCER REMOVAL AND REPLACEMENT

⚠ WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-800-833-9353 (WELD).

TEST DESCRIPTION

This procedure will aid the technician in the removal and replacement of the Power Wave Current Transducer.

MATERIALS NEEDED

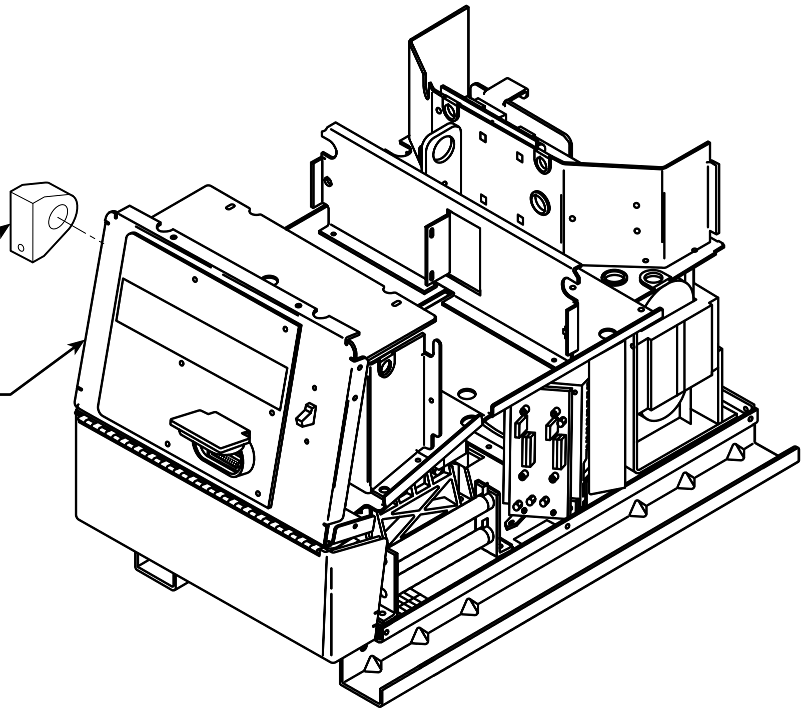
3/8" Nut driver
5/16" Open end wrench
9/16" Wrench
3/4" Wrench
Phillips head screw driver
Wire cutters
Wiring Diagram

This procedure should take approximately 25 minutes to perform.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

POWER WAVE CURRENT TRANSDUCER REMOVAL AND REPLACEMENT *(CONTINUED)*

FIGURE F.26 – POWER WAVE CURRENT TRANSDUCER REMOVAL AND REPLACEMENT PROCEDURE



REMOVAL PROCEDURE

1. Remove input power to the Power Wave 455/R.
2. Using the 3/8" nut driver, remove the case top and sides and the control box cover.
3. Perform the ***Capacitor Discharge*** procedure.
4. Using the 3/8" socket wrench or nut driver, remove the three screws along the bottom case front. See Figure F.26.
5. Using the 3/8" socket wrench, remove the four screws that hold the case front to the machine.
6. Label all leads to all output terminals. Using the 5/16" wrench and the 3/4" wrench, remove all leads from the three output terminals. See the Wiring Diagram.
7. Cut any necessary cable ties. Then carefully swing the front panel aside.
8. Remove the insulating tape from the heavy lead bolted connection. See Figure F.26. Using the 9/16" wrenches, remove the bolt, lock washer and nut.

POWER WAVE CURRENT TRANSDUCER REMOVAL AND REPLACEMENT *(CONTINUED)*

9. Using the phillips head screw driver, remove the screws and lock washers that hold the transducer to the front panel.
10. Remove the Power Wave current transducer.
11. Remove the standoffs from the transducer and save them for reassembly with the new transducer.

REPLACEMENT PROCEDURE

1. Attach the standoffs to the transducer.
2. Position the transducer on the back of the front panel and attach it with the two phillips screws and lock washers. Feed the output leads through the transducer.
3. Run the heavy lead through transducer and secure the bolted connection with the 9/16" bolt, lock washer and nut. Replace the insulating tape around the connection.
4. Using the 5/16" wrench and the 3/4" wrench, attach all leads to the three output terminals. See the Wiring Diagram.
5. Replace all cable ties cut during removal.
6. Install the case top and sides using the 3/8" nut driver.

Return to Section TOC
Return to Master TOC
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Return to Master TOC

OUTPUT RECTIFIER, STT CHOPPER BOARD AND RECTIFIER MODULE REMOVAL AND REPLACEMENT

⚠ WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-800-833-9353 (WELD).

TEST DESCRIPTION

This procedure will aid the technician in the removal and replacement of the output rectifier assembly and individual rectifier module replacement.

This procedure takes approximately 35 minutes to remove and replace the output rectifier, 5 minutes to remove the STT Chopper Board and 5 minutes to remove and replace the rectifier module.

MATERIALS NEEDED

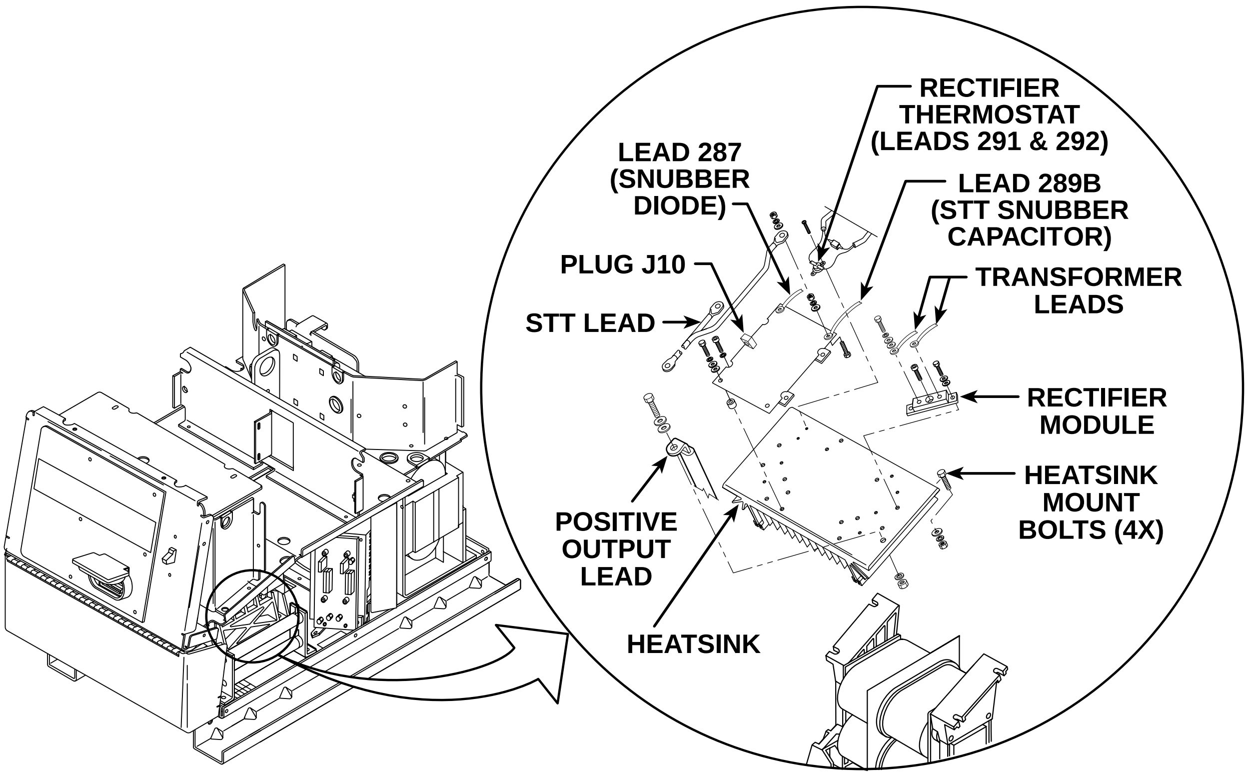
3/8” Nut driver
7/16” Wrench
9/16” Wrench
9/64” Allen wrench
3/16” Allen wrench
Needle-nose pliers
Slot head screwdriver
Penetrox A13 Thermal Joint Compound
Wiring Diagram

This procedure should take approximately 45 minutes to perform.

Return to Section TOC
Return to Master TOC

OUTPUT RECTIFIER, STT CHOPPER BOARD AND RECTIFIER MODULE REMOVAL AND REPLACEMENT *(CONTINUED)*

FIGURE F.27 – OUTPUT RECTIFIER, STT CHOPPER BOARD AND RECTIFIER MODULE REMOVAL AND REPLACEMENT



RECTIFIER ASSEMBLY REMOVAL PROCEDURE

1. Remove input power to the Power Wave 455/R.
2. Using the 3/8" nut driver, remove the case top and sides.
3. Perform the ***Capacitor Discharge*** procedure.
4. Using the 9/16" wrench, remove the Power Wave positive output lead from the rectifier heat sink. Note fastener hardware for reassembly. Refer to Figure F.27.
5. Using the 7/16" wrench, remove the STT output lead from the rectifier heat sink. Note fastener hardware for reassembly. Refer to Figure F.27.
6. Using the 7/16" wrench, remove the eight transformer leads from the rectifier modules. Label the leads and take note of lead placement for reassembly. Note that each screw has two flat washers and one lock washer.

OUTPUT RECTIFIER, STT CHOPPER BOARD AND RECTIFIER MODULE REMOVAL AND REPLACEMENT *(CONTINUED)*

7. Using the needle-nose pliers, remove leads #292 and #291 from the rectifier thermostat.
8. Disconnect plug J10 from the STT Chopper Board.
9. With the 7/16" wrench, remove lead #287 from the STT Snubber Diode D5.
10. With the 7/16" wrench, remove lead #289B from the STT Snubber Capacitor C10.
11. Using the 7/16" wrench, remove the four nuts and associated washers from the heat sink mounting bolts. The heat-sink assembly can be removed by carefully sliding the assembly forward and removing the mounting bolts.

STT CHOPPER BOARD REMOVAL AND REPLACEMENT PROCEDURE

1. Place the output rectifier assembly on a clean bench surface.
2. Using a slot head screw driver, remove the two nylon screws holding the board to the heat sink. Save the standoffs for reassembly.
3. Using the 7/16" wrench, remove the two bolts, lock washers and flat washers. Save the standoffs for reassembly.
4. Using the 3/16" allen wrench, remove the four screws and lock washers holding the board to the heat sink.
5. Carefully remove the STT Chopper Board.

REPLACEMENT PROCEDURE

1. Position the new board on the heat sink, using the standoffs for the slot head nylon screws and the allen head screws.
2. Install the four 3/16" allen head screws and lock washers.
3. Install the two nylon slot head screws.
4. Install the two 7/16" bolts, lock washers and flat washers.

Return to Section TOC
Return to Master TOC

OUTPUT RECTIFIER, STT CHOPPER BOARD AND RECTIFIER MODULE REMOVAL AND REPLACEMENT *(CONTINUED)*

RECTIFIER MODULE REMOVAL AND REPLACEMENT PROCEDURE

1. Using the 9/64" allen wrench, remove the cap screw from the center of the rectifier module that is to be replaced.
2. Using the 7/16" wrench, remove the two mounting bolts and associated washers from the rectifier module to be replaced.
3. Remove the faulty module.
4. This module requires special mounting considerations to prevent warping of the base plate. The heat sink surfaces must be clean and flat. Apply a thin, even coating of thermal compound, (Penetrox A13) 0.004 to 0.010 inches thick. Keep the compound away from the area of the mounting holes.
5. Press the new module firmly against the heat sink while aligning the mounting holes. Start all three screws two to three turns by hand.
6. Tighten each of the outer screws to between 5 and 10 in-lbs.
7. Tighten the center screw to between 12 and 18 in-lbs.
8. Tighten each of the outer screws again, this time to between 30 and 40 in/lbs.

RECTIFIER ASSEMBLY REPLACEMENT PROCEDURE

1. Position the assembly in place with the mounting bolts.
2. Assemble the nuts and associated washers to the mounting bolts.
3. Using the 7/16" wrench, tighten the four nuts on the mounting bolts.
4. Replace leads #292 and #291 to the thermostat.
5. Connect plug J10 to the STT Chopper Board.
6. With the 7/16" wrench, attach lead #287 from the STT Snubber Diode D5.
7. With the 7/16" wrench, attach lead #289B from the STT Snubber Capacitor C10.
8. Connect the eight transformer leads to the correct rectifier modules. Tighten the screws (with two flat washers and one lock washer) to between 30 and 40 in/lbs. **Do not stress the terminals when making these connections.**
9. Apply a thin coat of Penetrox A13 to the heat sink where the Power Wave positive output lead and the STT output lead attach.
10. Attach the Power Wave positive output lead to the heat sink using the 9/16" wrench.
11. Attach the STT output lead to the heat sink using the 7/16" wrench.
12. Install the case top and sides using the 3/8" nut driver.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
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Return to Master TOC

SWITCH BOARD AND FILTER CAPACITOR REMOVAL AND REPLACEMENT

WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-800-833-9353 (WELD).

TEST DESCRIPTION

This procedure will aid the technician in the removal and replacement of the switch board(s) and/or filter capacitor(s).

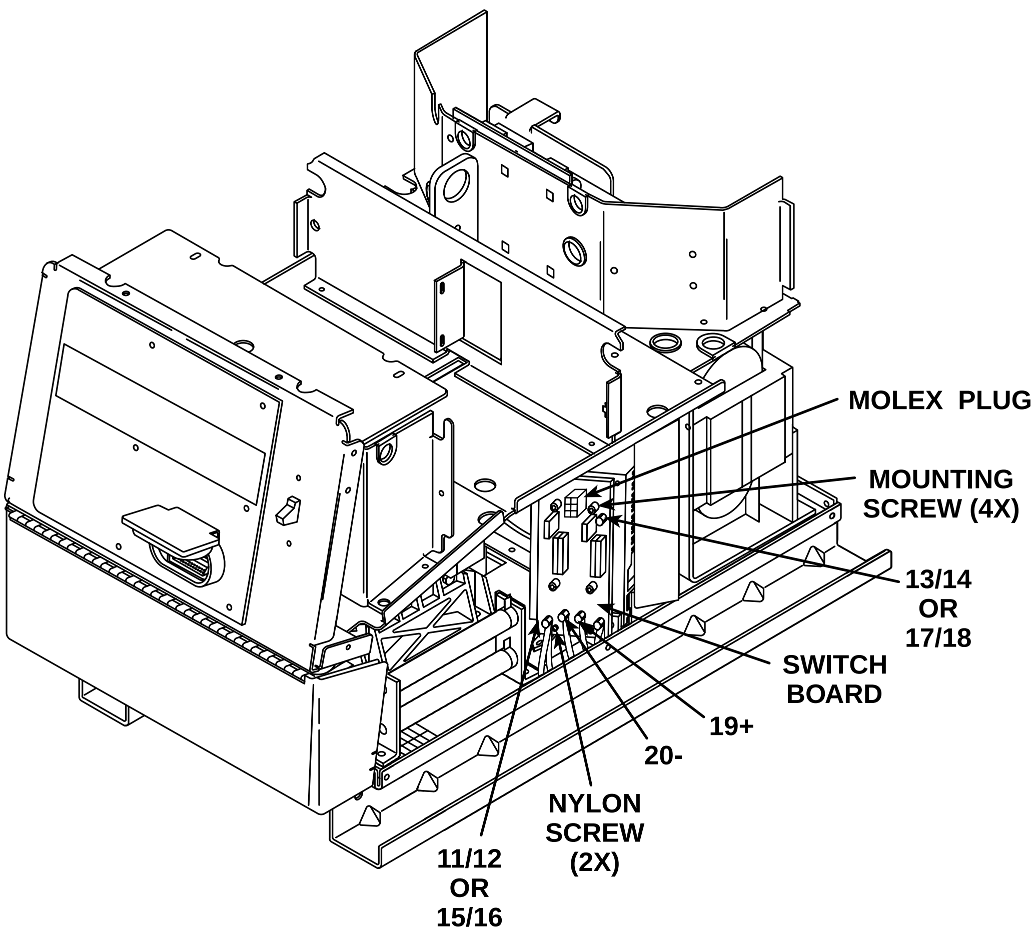
MATERIALS NEEDED

3/8” Nut driver
7/16” Wrench
3/16” Allen wrench
Slot head screwdriver
Penetrox A13 thermal joint compound

This procedure should take approximately 25 minutes to perform.

SWITCH BOARD AND FILTER CAPACITOR REMOVAL AND REPLACEMENT *(CONTINUED)*

FIGURE F.28 – SWITCH BOARD AND FILTER CAPACITOR REMOVAL AND REPLACEMENT



REMOVAL PROCEDURE

NOTE: Observe all static electricity precautions.

Lead and plug references below use a slash (/) to indicate machine right side/left side wire number differences.

1. Remove input power to the Power Wave 455/R.
2. Using the 3/8" nut driver, remove the case top and sides.
3. Perform the ***Capacitor Discharge*** procedure.
4. Using the 5/16" nut driver, remove the three screws mounting the glastic high voltage protective shield. Remove the shield.
5. Remove molex plug J40/J50 from the top of the switch board. Refer to Figure F.28.
6. Remove the mylar insulating shield covering leads 13/14 or 17/18. Cut the cable tie.

SWITCH BOARD AND FILTER CAPACITOR REMOVAL AND REPLACEMENT *(CONTINUED)*

7. Using the 7/16” wrench, remove leads 13/14 or 17/18 from the switch board.
8. Using the 7/16” wrench, remove leads 11/12 or 15/16 from the switch board.
9. Using the 7/16” wrench, remove leads 19C/D+ and 20C/D- from the switch board capacitor connection bolts.
10. With the slot head screwdriver, remove the two nylon mounting screws at the bottom of the switch board. Note placement of the shake-proof washers and fiber spacers.
11. Using the 3/16” allen wrench, carefully remove the four cap screws that mount the switch board to the heat sink.
12. Carefully remove the switch board from the heat sink.
13. If the filter capacitor is to be removed, carefully slide it out of the mounting bracket.

REPLACEMENT PROCEDURE

1. If the filter capacitor is to be replaced, carefully slide the new capacitor into the mounting bracket. Position the capacitor so the correct polarity terminal is lined up with the correct hole on the switch board.
2. All heat sink and IGBT mounting surfaces must be clean.
3. Apply a thin coat of thermal compound (Penetrox A13) 0.005 to 0.010 inches thick to the mating surfaces. Do not apply around mounting holes.
4. Apply a thin coat of Penetrox A13 to the capacitor terminals. Be careful not to apply compound to screw threads or threaded area of terminals.
5. Mount the new switch board and tighten the four cap head screws in the following manner.

   Tighten all until snug.

   Tighten all from 24 to 28 in-lbs.

   Tighten all from 40 to 48 in-lbs.
6. Make sure the capacitor is positioned correctly. Connect leads 19C/D+ and 20C/D- to the correct terminals. Tighten to 55 in/lbs.
7. Position and mount the two nylon screws, fiber spacers, and washers. Torque from 4 to 8 in-lbs.
8. Connect leads 11/12 or 15/16 to the correct terminal.
9. Connect leads 13/14 or 17/18 to the correct terminal.
10. Install the mylar insulating shield covering leads 11/12 or 15/16. Replace the cable tie.
11. Connect molex plug J40/J50 to the top of the switch board.
12. Using the 5/16” nut driver, install the glastic high voltage protective shield.
13. Install the case top and sides using the 3/8” nut driver.

RETEST AFTER REPAIR

Retest a machine:

If it is rejected under test for any reason that requires you to remove any part which could affect the machine's electrical characteristics.

OR

If you repair or replace any electrical components.

INPUT IDLE AMPS AND WATTS

Input Volts/Hertz	Maximum Idle Amps	Maximum Idle KW
208/60 230/60 400/60 460/60 575/60	4.0 3.3 2.1 2.0 1.8	0.45 0.45 0.45 0.45 0.45

MAXIMUM OUTPUT VOLTAGES

Input Volts/Hertz	Output Terminals - No load	X1 - X2	115 Volt Receptacles	
208/60 230/60 400/60 460/60 575/60	50-70 VDC	48.5 - 55 VDC	OCV 115 - 123 VAC	10 Amp Load 111 - 119 VAC

NOTES

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
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Return to Master TOC
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Return to Master TOC

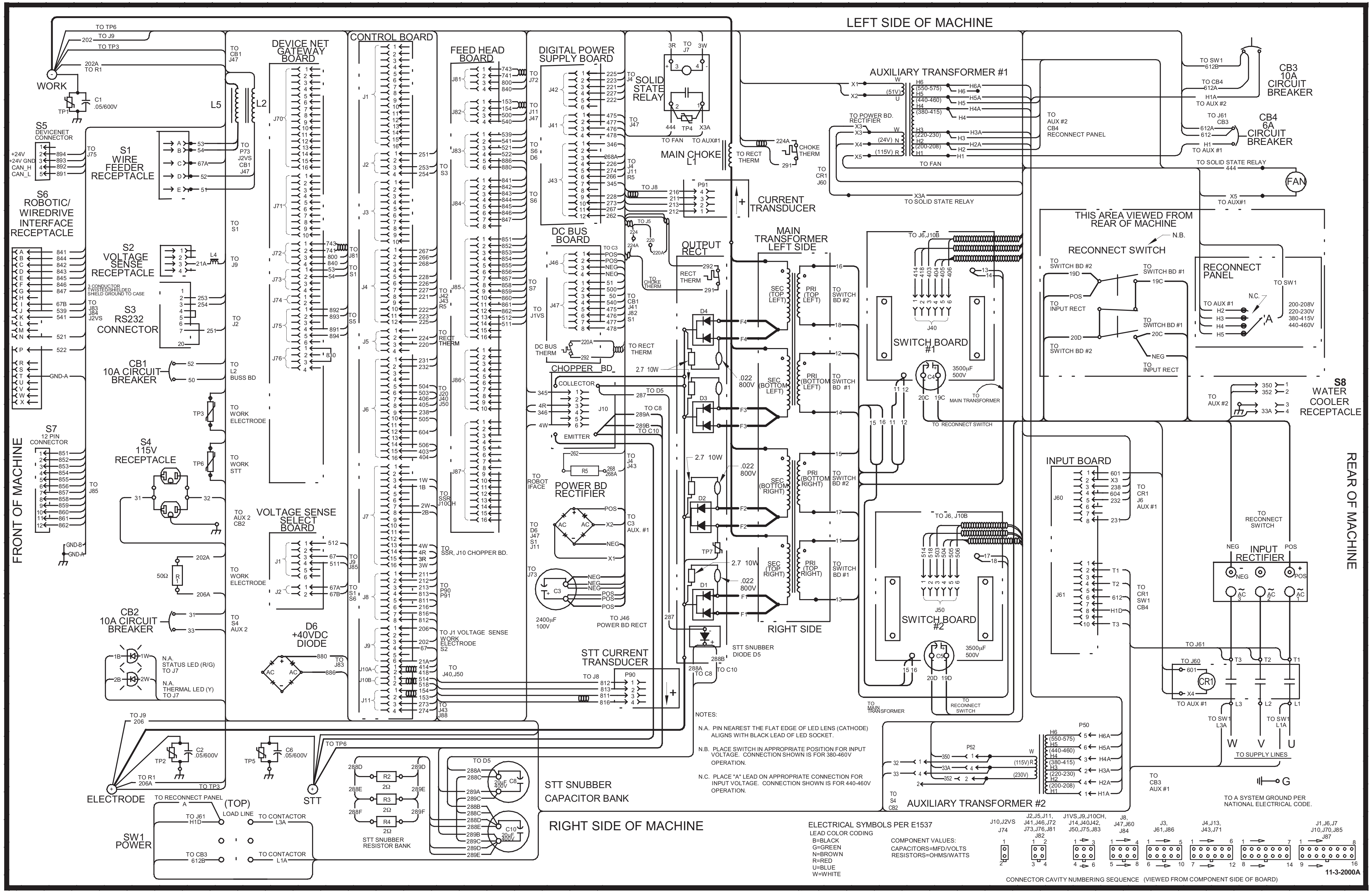
TABLE OF CONTENTS
- ELECTRICAL DIAGRAMS SECTION -

Return to Master TOC
Return to Master TOC
Return to Master TOC
Return to Master TOC

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
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WIRING DIAGRAM - POWER WAVE 455/R CODE 10675

POWER WAVE™ 455 / R WIRING DIAGRAM

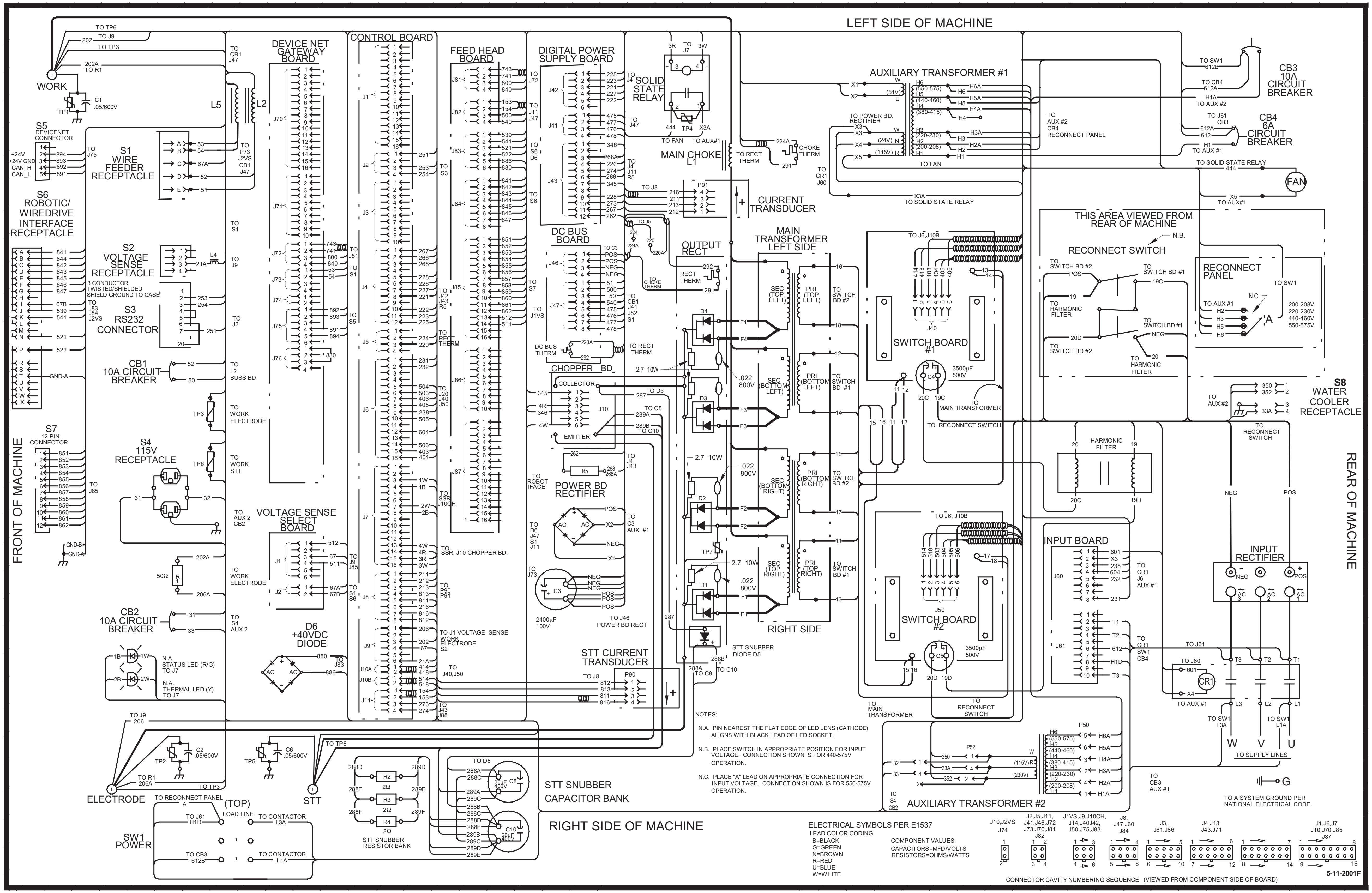


NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual. The wiring diagram specific to your code is pasted inside one of the enclosure panels of your machine.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
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Return to Master TOC

WIRING DIAGRAM- POWER WAVE 455/R CODE 10676

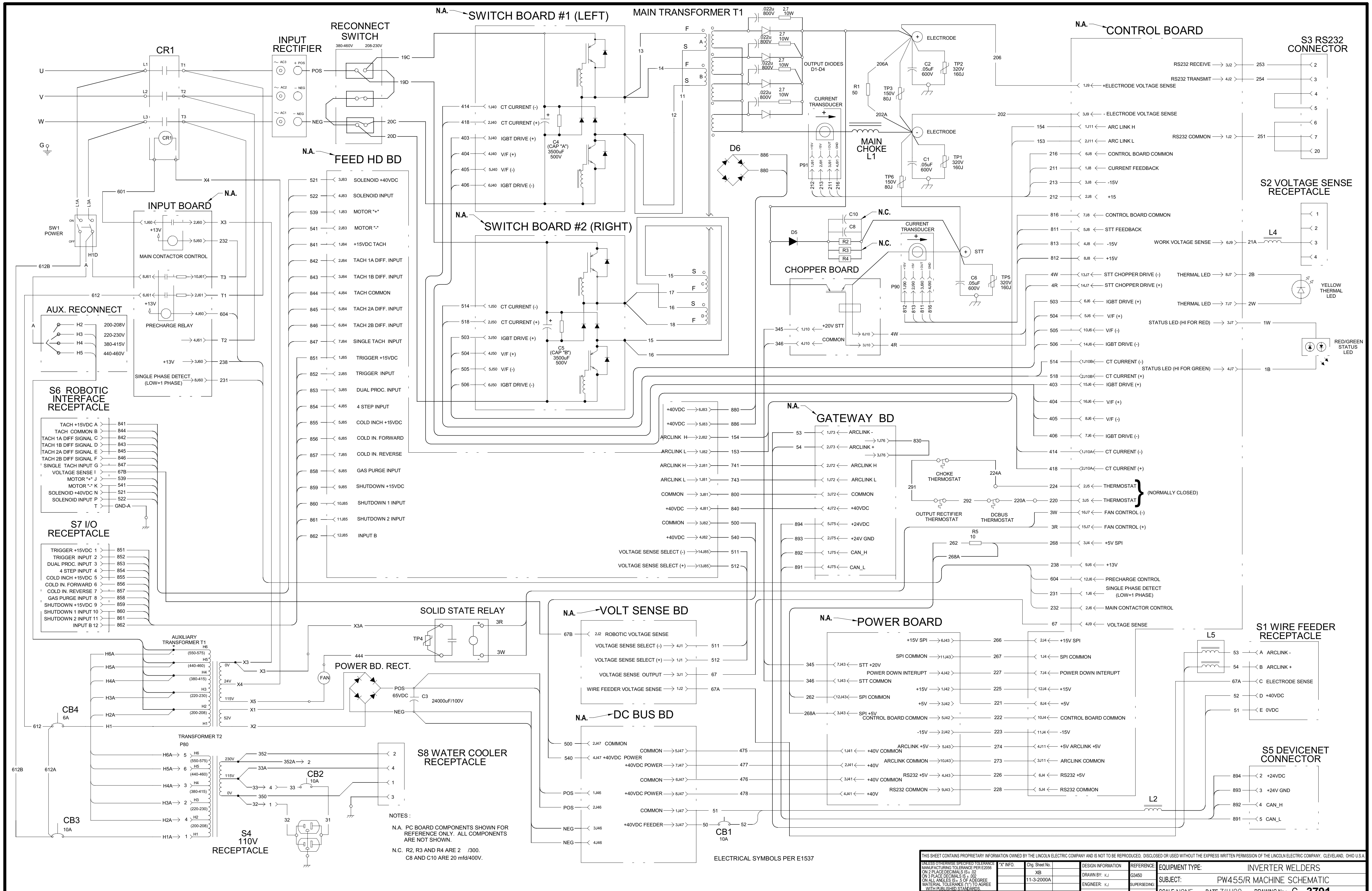
POWER WAVE™ 455 / R WIRING DIAGRAM



NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual. The wiring diagram specific to your code is pasted inside one of the enclosure panels of your machine.

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Return to Master TOC
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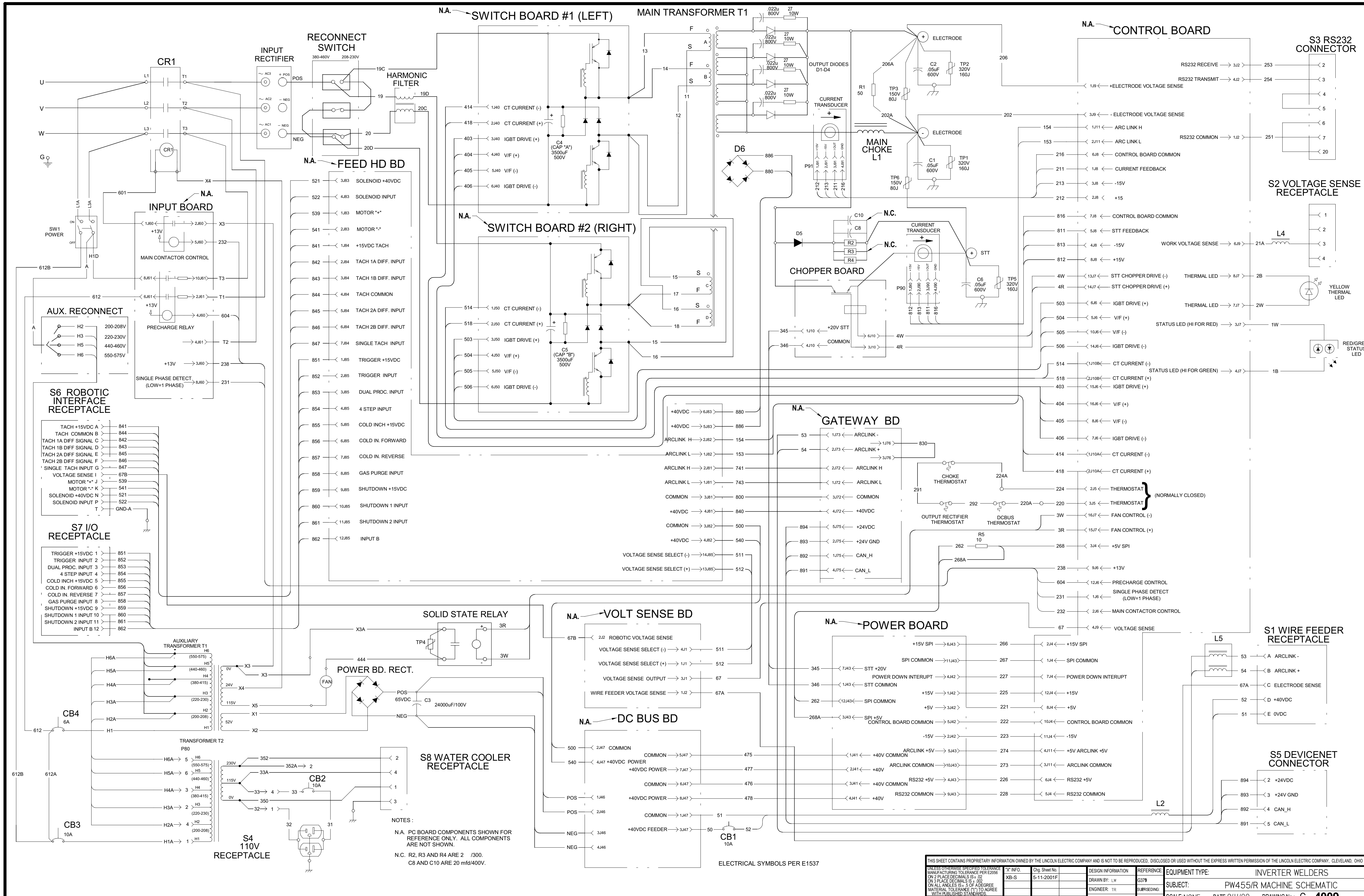
SCHEMATIC - COMPLETE MACHINE 10675



NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.

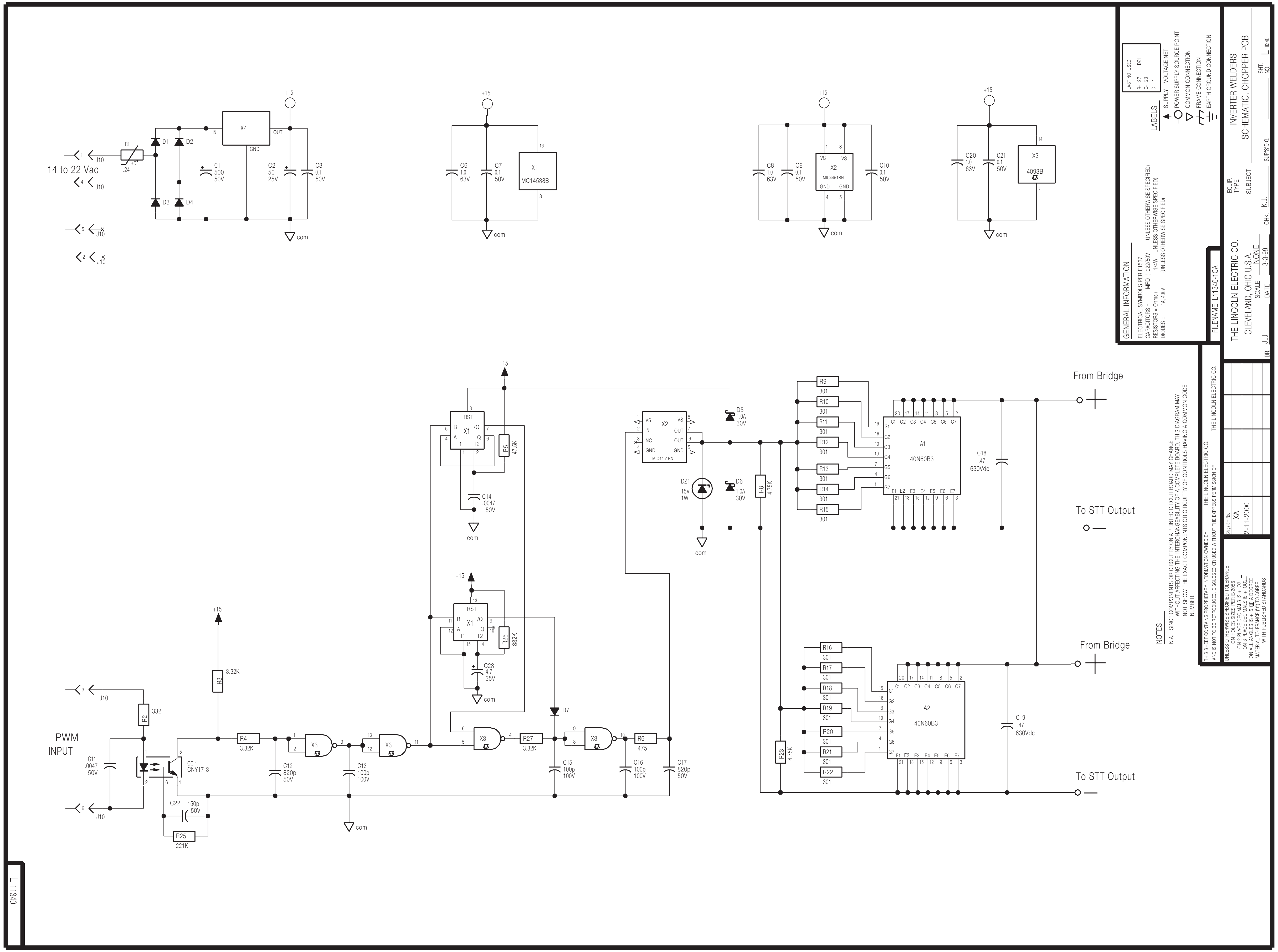
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SCHEMATIC-COMPLETE MACHINE CODE 10676



NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.

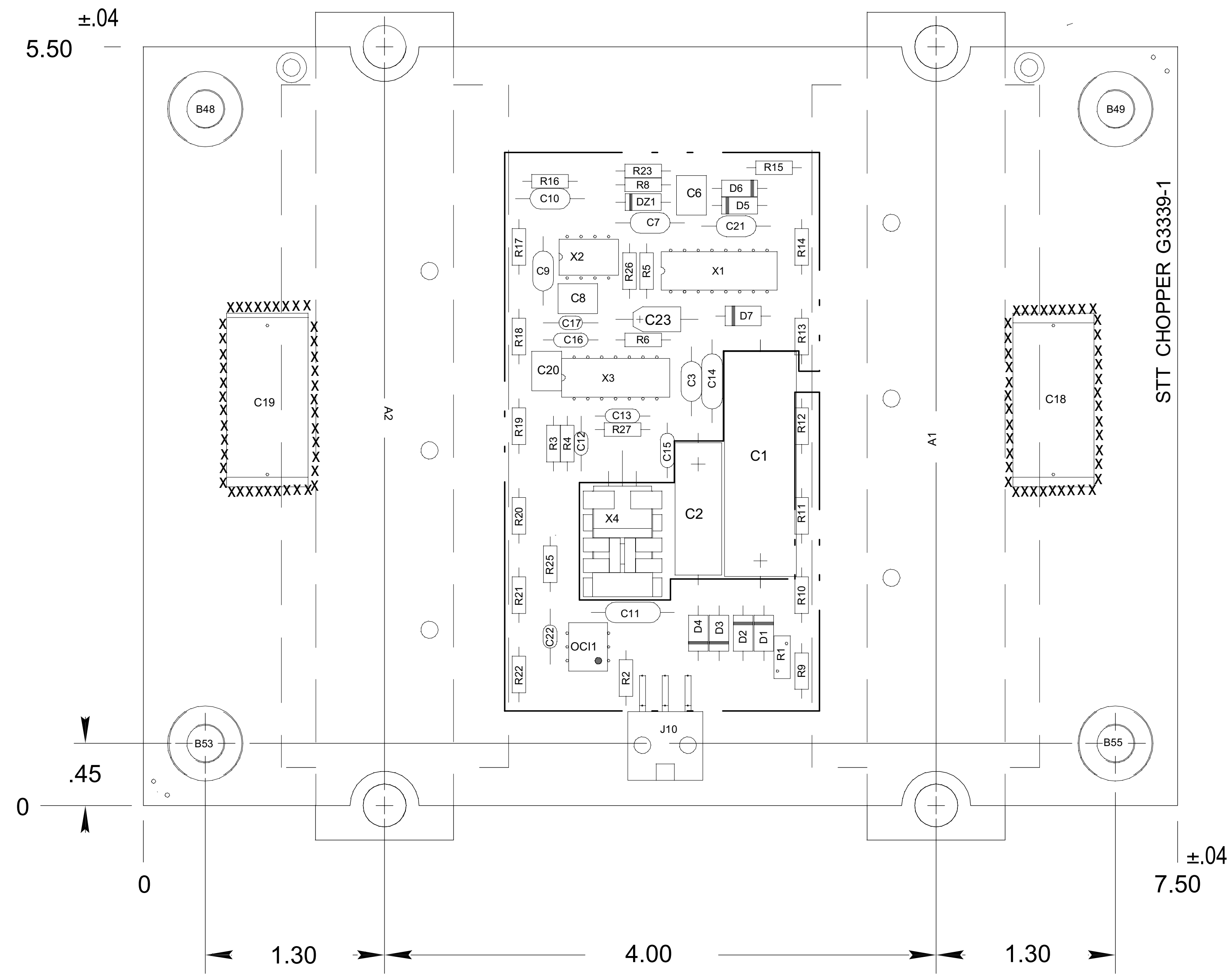
SCHEMATIC - CHOPPER PC BOARD



NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.

Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC
Return to Section TOC
Return to Master TOC

PC BOARD ASSEMBLY -CHOPPER



ITEM	REQ'D	PART NO.	IDENTIFICATION
C1	1	T11577-49	500/50
C2	1	S13490-8	50/25
C3,C7,C9,10,C21	5	S16668-11	.1/50
C6,C8,C20	3	S13490-173	CAP.,MPF,1.0 uF,63VDC
C11,C14	2	S16668-10	4700pF/50
C12,C17	2	S16668-7	820pF/50
C13,C15,C16	3	S16668-3	100pF/100
C18,C19	2	S20500-2	.47/630
C22	1	S16668-9	150pF/100
C23	1	S13490-25	4.7/35
D1,D2,D3,D4,D7	5	T12199-1	1N4004
D5,D6	2	T12705-23	1N5818
DZ1	1	T12702-29	1N4744A
J10	1	S20351-6	HEADER
OCI1	1	S15000-10	OPTO ISOLATOR
R1	1	S18380-5	THERM.,PTC,.5-1.17 OHM, .5A
R2	1	S19400-3320	332 1/4W
R3,R4,R27	3	S19400-3321	3.32K 1/4W
R5	1	S19400-4752	47.5K 1/4W
R6	1	S19400-4750	475 1/4W
R8,R23	2	S19400-4751	4.75K 1/4W
R9,R10,R11,R12,R13,R14, R15,R16,R17,R18,R19,R20, R21,R22	14	S19400-3010	301 1/4W
R25	1	S19400-2213	221K 1/4W
R26	1	S19400-3323	332K 1/4W
X1	1	S15018-9	CMOS MC14538B
X2	1	S15018-21	IC,DRIVER,12A MOSFET(SS)
X3	1	S15018-15	14 PIN IC
X4	1	S15128-6	VOLTAGE REGULATOR

CAPACITORS = MFD/VOLTS
RESISTORS = OHMS

UNLESS OTHERWISE SPECIFIED TOLERANCE MANUFACTURING TOLERANCE PER E2056 ON 2 PLACE DECIMALS IS ± .02 ON 3 PLACE DECIMALS IS ± .002 ON ALL ANGLES IS ± .5 OF A DEGREE MATERIAL TOLERANCE ("t") TO AGREE WITH PUBLISHED STANDARDS.
DO NOT SCALE THIS DRAWING

"X" INFO. | Chg. Sheet No.: 2-11-2000, 8-4-2000J, 9-22-2000A

DESIGN INFORMATION
DRAWN BY: JLV/RAS
ENGINEER: KJ
APPROVED: DRS

REFERENCE: G3135-1
SUPERSEDING:

EQUIPMENT TYPE: INVERTER WELDERS
SUBJECT: CHOPPER P.C. BOARD ASSEMBLY
SCALE: 1:1 DATE: 2-23-98 DRAWING No.: G 3339-1

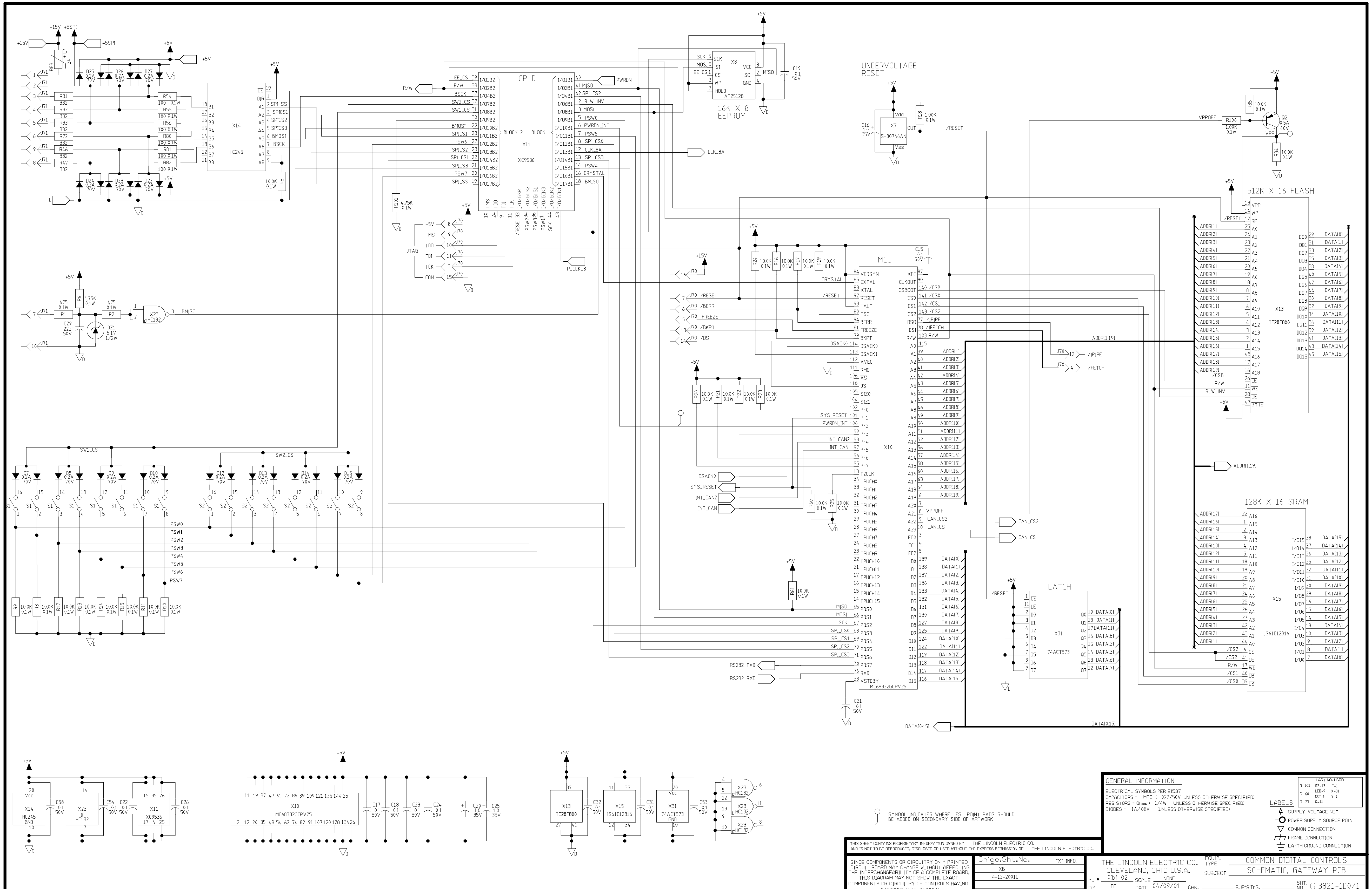
SOLID EDGE

EN-170

NOTE: Lincoln Electric assumes no responsibility for liablilities resulting from board level troubleshooting. PC Board repairs will invalidate your factory warranty. **Individual Printed Circuit Board Components are not available from Lincoln Electric.** This information is provided for reference only. Lincoln Electric discourages board level troubleshooting and repair since it may compromise the quality of the design and may result in danger to the Machine Operator or Technician. Improper PC board repairs could result in damage to the machine.

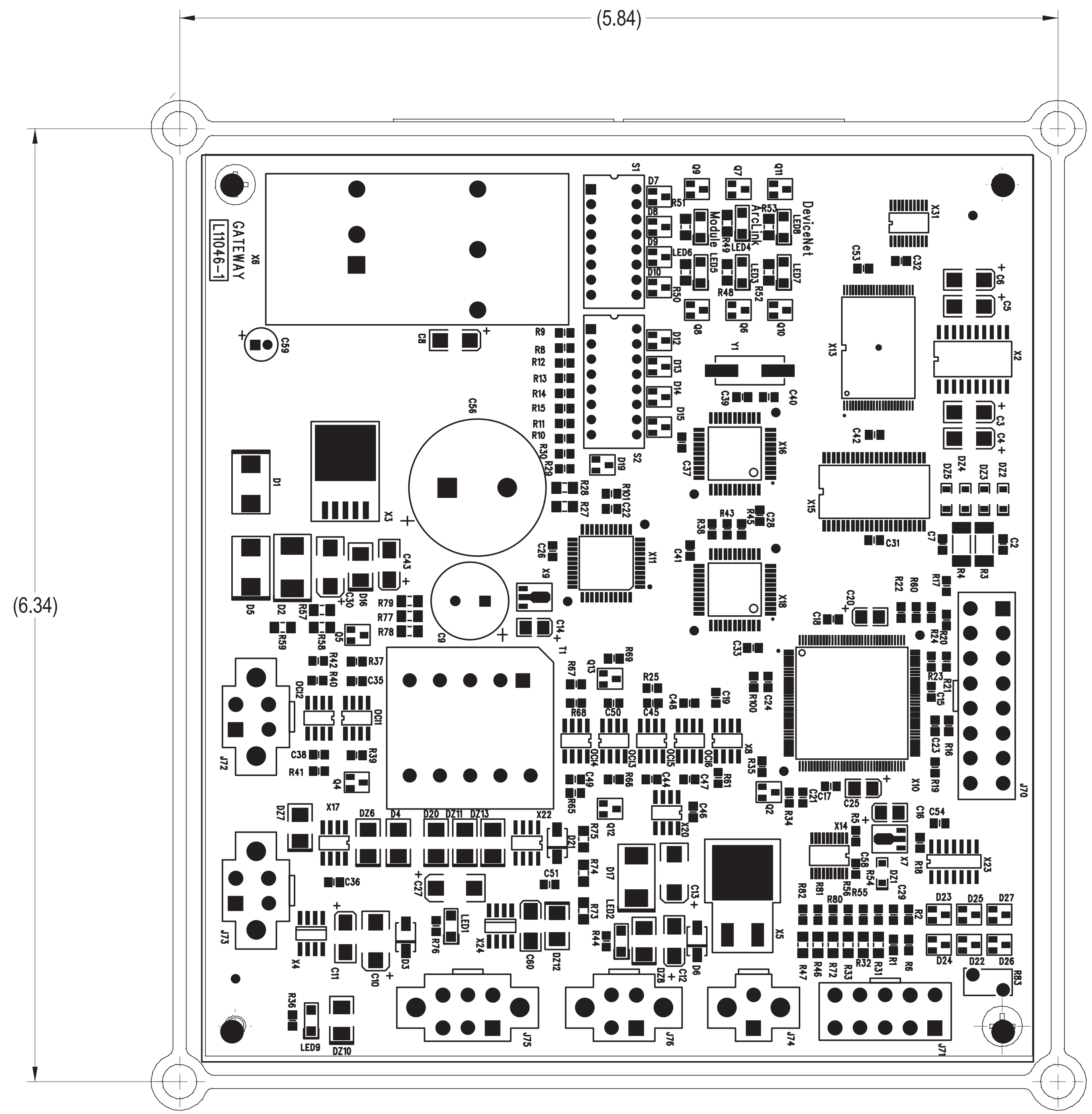
Return to Section TOC
Return to Master TOC
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SCHEMATIC-DEVICENET/GATEWAY PC BOARD



NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.

PC BOARD ASSEMBLY-DEVICENET/GATEWAY



ITEM	PART NO.	QTY	PC BOARD REFERENCE DESIGNATORS	DESCRIPTION
1	G3820-D	1		GATEWAY PC BOARD BLANK
2	S24671	1		PLUG, KEYING PLUG
3	M19436-5	1		POTTING TRAY
4	S8025-80	2		SELF TAPPING SCREW
5	E2527	195g.	(6.87OZ)	EPOXY ENCAPSULATING RESIN
6	E3539	AS REQ.		ELECTRICAL INSULATING COMPOUND
7	S24824-3	1	X11	SOFTWARE CPLD
8	S24825-1	1	X13	SOFTWARE, FLASH
FOR ITEMS LISTED BELOW REFER TO ELECTRONIC COMPONENT DATABASE FOR COMPONENT SPECIFICATIONS				
9	S25020-13SMT	2	C2,C7	CAPACITOR,SMD,CERAMIC,150pF,100V,5%,C
10	S25024-8SMT	5	C3,C4,C5,C6,C8	CAPACITOR,SMD,TANTALUM,10MF,16V,10%,S
11	S13490-179	1	C9	CAPACITOR,ALEL,1000,35V,20%
12	S25024-5SMT	4	C10,C13,C27,C30	CAPACITOR,SMD,TANTALUM,4.7MF,35V,10%,
13	S25024-6SMT	4	C11,C12,C43,C60	CAPACITOR,SMD,TANTALUM,22MF,16V,10%,S
14	S25024-2SMT	4	C14,C16,C20,C25	CAPACITOR,SMD,TANTALUM,1.0MF,35V,10%,
15	S25020-3SMT	30	C15,C17,C18,C19,C21,C22 C23,C24,C26,C28,C31,C32 C33,C35,C36,C37,C38,C41 C42,C44,C45,C46,C47,C48 C49,C50,C51,C53,C54,C58	CAPACITOR,SMD,CERAMIC,0.1MF,50V,10%,X
16	S25020-15SMT	3	C29,C39,C40	CAPACITOR,SMD,CERAMIC,22PF,50V,5%,COG
17	S13490-182	1	C56	CAP,ALEL,3300,63V,20%
18	S13490-181	1	C59	CAP,ALEL,22,63V,20%
19	S25040-10SMT	2	D1,D5	DIODE,SMD,3A,400V,D0-214AB
20	S25040-9SMT	1	D2	DIODE,SMD,3A,200V,D0-214AB,ULTRA-FAST
21	S25040-2SMT	3	D3,D6,D21	DIODE,SMD,1A,400V,DO-214BA/AC
22	S25040-11SMT	3	D4,D16,D20	DIODE,SMD,1A,600V,S403A,ULTRA-FAST RE
23	S25040-4SMT	8	D7,D8,D9,D10,D12,D13,D14 D15	DIODE,SMD,DUAL,0.200A,70V,UFR
24	S25049-3SMT	1	D17	DIODE,SMD,3A,40V,SCHOTTKY,CASE 403-3
25	S25049-4SMT	1	D19	DIODE,SMD,DUAL,200MA,30V,SCHOTTKY,SOT
26	S25040-5SMT	6	D22,D23,D24,D25,D26,D27	DIODE,SMD,DUAL,0.200A,70V,UFR
27	S25046-1SMT	1	DZ1	ZENER DIODE,SMD,0.5W,5.1V, 5%,SOD123
28	S25046-3SMT	4	DZ2,DZ3,DZ4,DZ5	ZENER DIODE,SMD,0.5W,18V, 5%,SOD123
29	S25044-9SMT	7	DZ6,DZ7,DZ8,DZ10,DZ11,DZ12 DZ13	ZENER DIODE,SMD,3W,6.2V,5%, SMB
30	S18248-16	1	J70	CONNECTOR,MOLEX,MINI,PCB,16-PIN
31	S18248-10	1	J71	CONNECTOR,MOLEX,MINI,PCB,10-PIN
32	S24020-4	3	J72,J73,J76	CONNECTOR,MOLEX,MINI,PCB,4-PIN,TIN
33	S24020-2	1	J74	CONNECTOR,MOLEX,MINI,PCB,2-PIN,TIN
34	S24020-6	1	J75	CONNECTOR,MOLEX,MINI,PCB,6-PIN,TIN
35	S25080-2SMT	6	LED1,LED2,LED3,LED5,LED7 LED9	LED,SMD,GREEN,CLEAR,S1206
36	S25080-1SMT	3	LED4,LED6,LED8	LED,SMD,RED,CLEAR,S1206
37	S15000-28SMT	4	OCI1,OCI2,OCI3,OCI4	OPTOCOUPLER,SMD,TTL-OUT,HI-SPD,HI-CMR
38	S15000-32SMT	2	OCI5,OCI6	OPTOCOUPLER,SMD,CMOS,HIGH SPEED,HIGH
39	S25050-2SMT	5	Q2,Q4,Q5,Q12,Q13	TRANSISTOR,SMS,PNP,SOT23,0.5A, 40V,MM
40	S25051-4SMT	6	Q6,Q7,Q8,Q9,Q10,Q11	TRANSISTOR,SMD,NMF,SOT-23,0.115A,60V,
41	S25000-4750SMT	6	R1,R2,R39,R40,R66,R67	RESISTOR,SMD,METAL FILM,1/10W,475OHMS
42	S25003-2000SMT	2	R3,R4	RESISTOR,SMD,1W,200OHMS,1%
43	S25000-1002SMT	25	R5,R8,R9,R10,R11,R12,R13 R14,R15,R16,R17,R19,R20 R21,R22,R23,R24,R25,R29 R34,R35,R42,R60,R61,R69	RESISTOR,SMD,METAL FILM,1/10W,10.0K,1
44	S25000-4751SMT	5	R6,R38,R43,R45,R101	RESISTOR,SMD,METAL FILM,1/10W,4.75K,1
45	S25000-1001SMT	6	R18,R37,R41,R65,R68,R100	RESISTOR,SMD,METAL FILM,1/10W,1.00K,1
46	S25001-1002SMT	2	R27,R28	RESISTOR,SMD,10K,1/4W,1206,1%,TR
47	S25000-1501SMT	1	R30	RESISTOR,SMD,METAL FILM,1/10W,1.50K,1
48	S25001-3320SMT	6	R31,R32,R33,R46,R47,R72	RESISTOR,SMD,332OHMS,1/4W,1206,1%,TR
49	S25000-7500SMT	3	R36,R44,R76	RESISTOR,SMD,METAL FILM,1/10W,750OHMS
50	S25001-1211SMT	2	R48,R49	RESISTOR,SMD,1.21K,1/4W,1206,1%,TR
51	S25001-2670SMT	7	R50,R51,R52,R53,R57,R58 R59	RESISTOR,SMD,267OHMS,1/4W,1206,1%,TR
52	S25000-1000SMT	6	R54,R55,R56,R80,R81,R82	RESISTOR,SMD,METAL FILM,1/10W,100OHMS
53	S25001-24R9SMT	3	R73,R74,R75	RESISTOR,SMD,24.9OHMS,1/4W,1206,1%,TR
54	S25001-2000SMT	3	R77,R78,R79	RESISTOR,SMD,200OHMS,1/4W,1206,1%,TR
55	S18380-5	1	R83	THERMISTOR,PTC,0.5-1.17 OHMS,0.5A
56	S19869-8	2	S1,S2	SWITCH,DIP,SPST,8-CIRCUITS
57	S20375-8	1	T1	TRANSFORMER,PCB,PWM,FLYBACK
58	S20353-1SMT	1	X2	IC,SMD,CMOS,DRIVER,RECEIVER,EIA232,14
59	S15128-25SMT	1	X3	IC,SMD,VOLTAGE REGULATOR,FIXED,POSITI
60	S25068-6SMT	2	X4,X24	IC,SMD,VOLT REG,FIXED,3-T,(+),0.1A,5V
61	S15128-5SMT	1	X5	IC,VOLT REG,SMD,FIXED,3-T,(+),1A,5V
62	S24841-1	1	X6	IC,MODULE,CONVERTER,DC-DC,+5V/3A OUT
63	S25068-7SMT	2	X7,X9	IC,SMD,CMOS,UNDERVOLT-SENSING,RESET,M
64	S25069-2SMT	1	X8	IC,SMD,CMOS,EEPROM,SERIAL,SPI,64Kx8,S
65	M15101-14SMT	1	X10	IC,SMD,CMOS,MCU,32-BIT,2K-RAM,TPU,25M
66	S25070-3SMT	1	X11	CPLD,PROGRAMMABLE,XC9536,44-PIN,VQFP(
67	S25069-3SMT	1	X13	IC,SMD,CMOS,EEPROM,FLASH,16-BIT,512K
68	S17900-11SMT	1	X14	IC,SMD,CMOS,TRANCEIVER,BUS,3-STATE,OC
69	S25069-4SMT	1	X15	RAM,STATIC,16-BIT,128K,44-PIN,TSOP
70	S20353-5SMT	2	X16,X18	IC,CMOS,CONTROLLER,COMMUNICATION,SERI
71	S20353-4SMT	2	X17,X22	IC,CMOS,SMD,XCVR,EIA485(SS)
72	S25068-4SMT	1	X20	IC,SMD,TRANSCEIVER,CAN,UC5350,S0IC-8
73	S17900-24SMT	1	X23	IC,SMD,CMOS,GATE,NAND,2-INPUT,QUAD,SC
74	S25065-2SMT	1	X31	IC,SMD,ACT,LATCH,OCTAL,3-STATE,TSSOP-
75	S25082-1SMT	1	Y1	CRYSTAL,SMD,QUARTZ,16MHZ

UNLESS OTHERWISE SPECIFIED:
RESISTANCE = OHMS

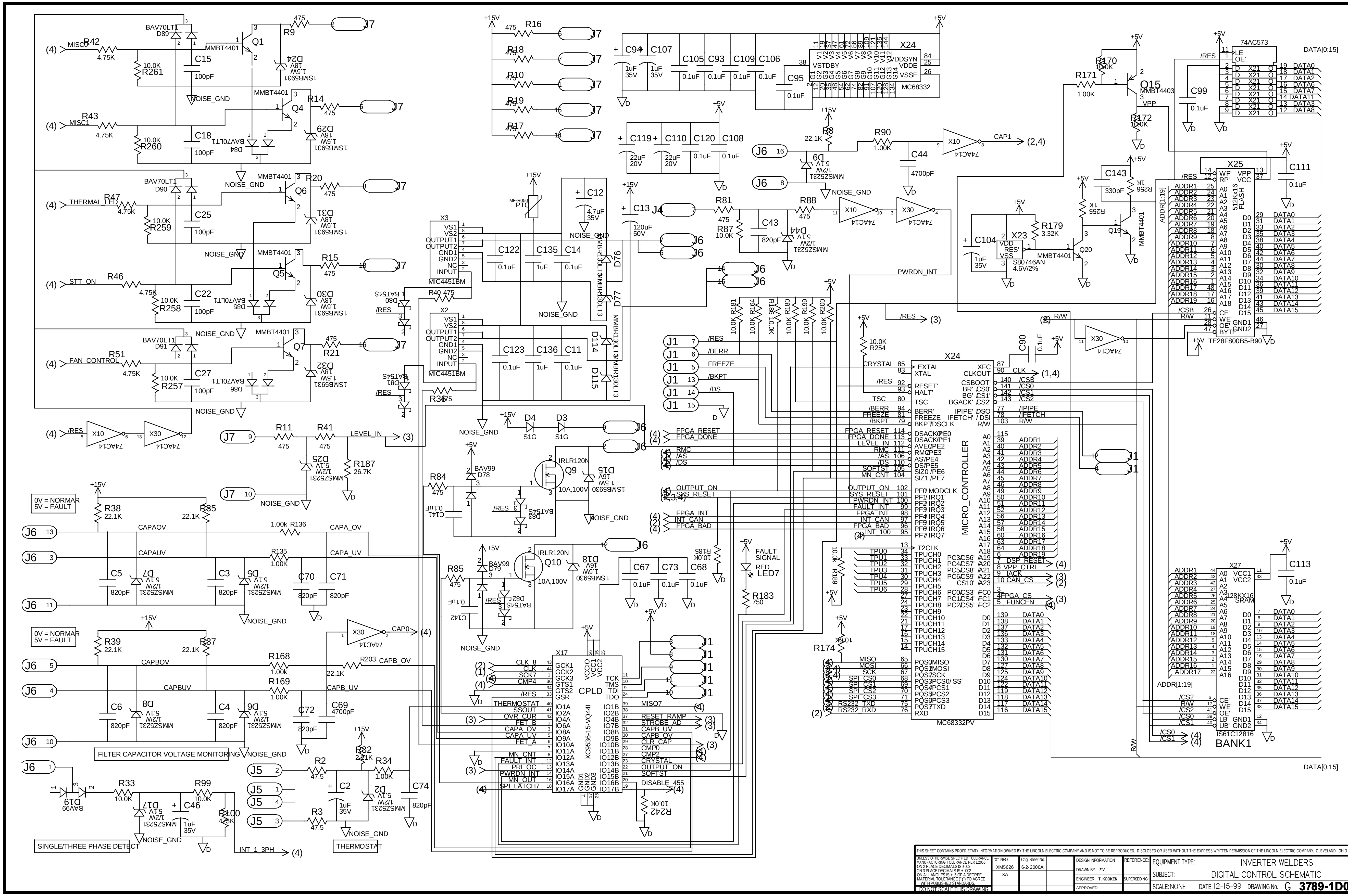
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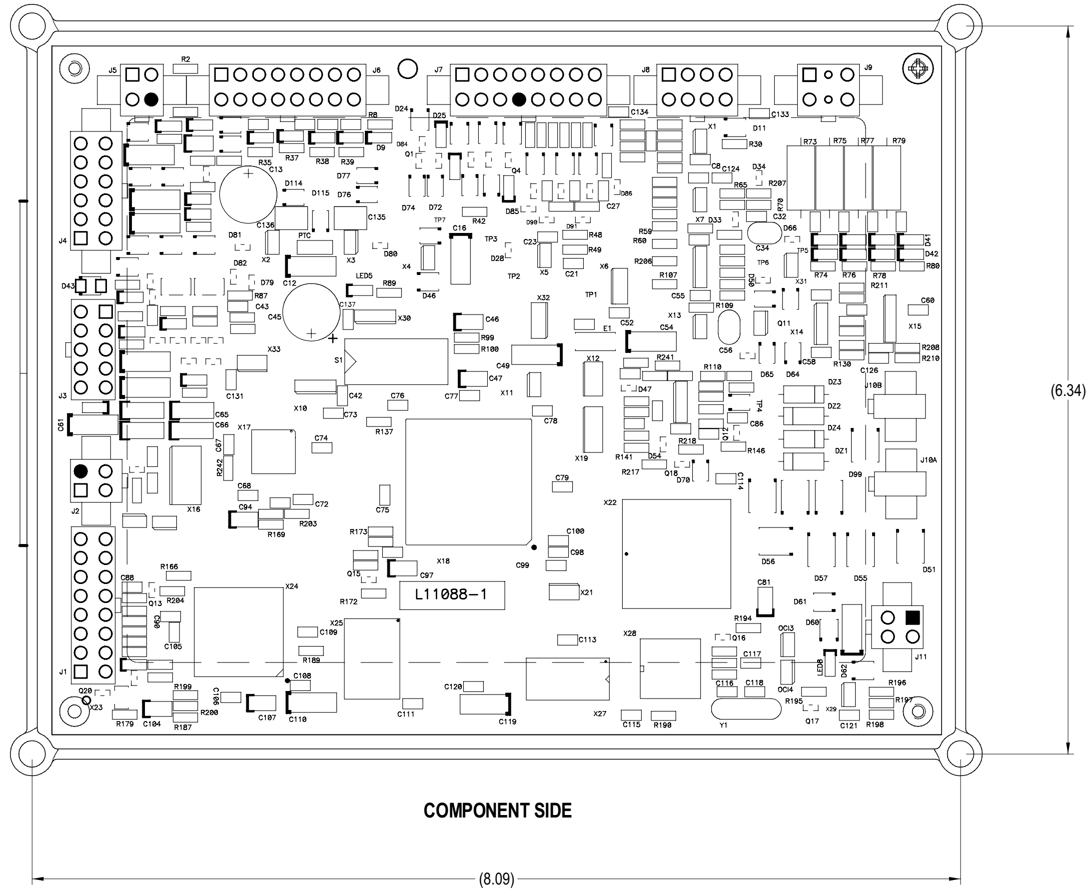
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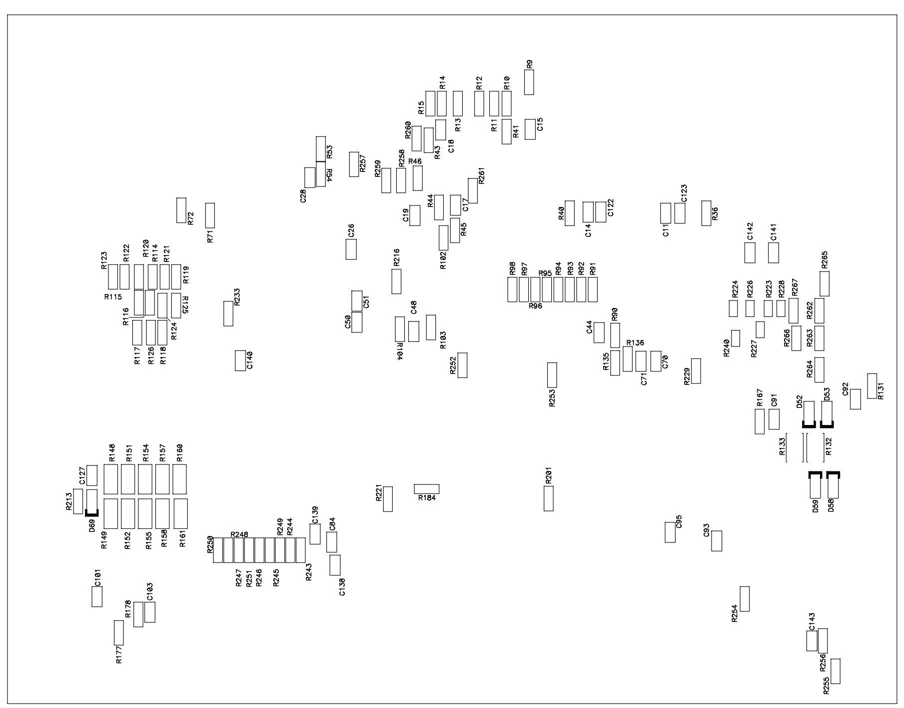
SCHEMATIC - CONTROL PC BOARD



NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.



COMPONENT SIDE



OTHER COMPONENT SIDE (BACKSIDE)

FOR ITEMS LISTED BELOW REFER TO ELECTRICAL DATABASE FOR COMPONENT SPECIFICATIONS

11	S25020-3SMT	68	SCAP,0.1uF,0805,50V,X7R,10%,TR	C138 C134 C133 C125 C55 C96 C98 C100 C28 C82 C14 C11 C83 C103 C121 C101 C117 C115 C111 C113 C85 C90 C48 C93 C109 C120 C127 C106 C95 C105 C73 C68 C8 C114 C108 C99 C77 C76 C75 C84 C79 C67 C88 C80 C50 C78 C23 C21 C91 C51 C92 C58 C57 C52 C60 C59 C131 C123 C122 C124 C30 C129 C139 C140 C42 C137 C141 C142
12	S14390-173	2	CAP,1uF,RA,63V,10%,NP	C136 C135
13	S25020-2SMT	2	SCAP,0.022uF,0805,50V,X7R,10%,	C86 C7
14	S25020-10SMT	2	SCAP,4700pF,0805,50V,X7R,10%	C44 C69
15	S25020-5SMT	4	SCAP,22pF,0805,50V,COG,5%,TR,N	C118 C116 C128 C130
16	S25020-18SMT	1	SCAP,10pF,CER,0805,100V,5%	C32
17	S25020-13SMT	7	SCAP,150pF,0805,100V,COG,5%,TR,	C64 C89 C26 C35 C36 C38 C37
18	S25020-4SMT	11	SCAP,820pF,0805,50V,COG,5%,TR,	C43 C4 C74 C3 C71 C19 C70 C5 C72 C6 C17
19	S24833-1	2	CAP,0.27uF,MF,50V,5mm,5%,TR,NP	C56 C34
20	S25020-14SMT	2	SCAP,330pF,100V	C126 C143
21	S25025-5SMT	9	SCAP,4.7uF,7343,35V,10%,TR,NP	C12 C102 C1 C9 C10 C39 C40 C16 C61
22	S25024-2SMT	8	SCAP,1uF,TAN,3528,35V,TR,NP	C94 C97 C104 C107 C47 C81 C2 C46
23	S25024-8SMT	4	SCAP,10uF,TAN,6032,TR,NP	C66 C62 C65 C63
24	S25024-10SMT	4	SCAP,22uF,TAN,7343,25V,10%	C119 C110 C49 C54
25	S13490-179	1	CAP,1000uF,ALU,35V,20%,NP	C45
26	S13490-183	1	SCAP,120MF,50V,20%,RADIAL,AE	C13
27	S25040-2SMT	13	SDIO,1A,400V,DO-214BA,GLS	D68 D67 D4 D3 D75 D63 D64 D65 D70 D72 D71 D73 D74
28	S25046-1SMT	19	SDIO,MMSZ5231BT1,5.1V,NP	D25 D45 D44 D17 D9 D6 D2 D5 D7 D8 D35 D36 D38 D37 D42 D41 D40 D39 D69
29	S25044-9SMT	7	SDIO,1SMB5920BT3,6.2V,NP	D62 D61 D60 D13 D12 D1 D46
30	S25046-3SMT	4	SDIO,MMSZ5248B,18V,ZENER,TR,NP	D53 D52 D58 D59
31	S25044-10SMT	3	SDIO,B5930,16V,1.5W,ZENER,TR,N	D18 D15 D43
32	S25044-5SMT	9	SDIO,1SMB5931BT3,3W,18V,5%	D27 D32 D26 D30 D31 D29 D24 D14 D16
33	S25044-4SMT	2	SDIO,B5929,15V,1.5W,ZENER,TR,N	D10 D11
34	S25040-5SMT	13	SDIO,BAV99LT1,SOT23,DUAL SWITC	D66 D50 D33 D49 D19 D78 D79 D102 D103 D104 D105 D106 D107
35	S25049-4SMT	8	SDIO,BAT54S,DUAL,30V,200mA	D34 D54 D28 D47 D80 D81 D82 D83
36	S25080-2SMT	8	SLED,GRN,1206,TR,NP	LED8 LED1 LED5 LED3 LED2 LED4 LED6 LED9
37	S25080-1SMT	2	SLED,RED,1206,TR,NP	LED7 LED10
38	S25083-1SMT	1	SIND,FERRITEBEAD,TR,NP	E1
39	S25001-4752SMT	8	SRES,47.5K,1206,1%,1/8W,TR,NP	R230 R27 R28 R26 R53 R29 R110 R57
40	S25001-2211SMT	8	SRES,2.21K,1206,1%,1/8W,NP	R25 R13 R12 R32 R1 R31 R134 R66
41	S25001-1001SMT	33	SRES,1K,1206,1%,1/8W,TR(9X0056	R171 R178 R177 R193 R231 R167 R61 R34 R89 R82 R163 R135 R136 R169 R131 R112 R60 R56 R126 R71 R54 R69 R68 R143 R144 R58 R206 R213 R214 R90 R168 R255 R256
42	S25001-1002SMT	57	SRES,10K,MF,1206,1%,1/8W	R173 R191 R181 R164 R170 R172 R189 R186 R180 R91 R92 R93 R94 R95 R96 R97 R98 R22 R174 R201 R185 R104 R87 R33 R99 R260 R261 R139 R140 R121 R200 R107 R199 R103 R221 R229 R204 R242 R241 R216 R217 R218 R243 R246 R244 R245 R247 R248 R249 R250 R251 R252 R253 R254 R257 R258 R259
43	S25001-4750SMT	28	SRES,475,1206,1%,1/8W,TR,NP	R195 R194 R41 R11 R83 R86 R166 R165 R21 R15 R20 R88 R81 R14 R9 R17 R19 R10 R18 R16 R141 R138 R119 R116 R85 R84 R40 R36
44	S25001-4751SMT	15	SRES,4.75K,1206,1%,1/8W,SM100-	R190 R192 R182 R184 R137 R146 R209 R210 R222 R42 R43 R46 R47 R51 R67
45	S25003-2000SMT	2	SRES,200,2512,1%,1W,TR,NP	R132 R133
46	S25001-1501SMT	7	SRES,1.5K,1206,1%,1/8W,NP	R113 R118 R122 R74 R76 R80 R78
47	S25001-7500SMT	1	SRES,750,1206,1%,1/8W,NP	R183
48	S25001-5110SMT	2	SRES,511,MF,1206,1%,1/8W,TR	R24 R23
49	S25001-1004SMT	2	SRES,1M,1206,1%,1/8W,TR(9X0098	R212 R211
50	S25001-2672SMT	4	SRES,26.7K,THK,1206,1%,1/8W,10	R187 R114 R120 R72
51	S25001-3321SMT	4	SRES,3.32K,1206,1%,1/8W,NP(AM2	R123 R128 R129 R179
52	S25001-2212SMT	6	SRES,22.1K,1206,1%,1/8W,TR,NP	R37 R38 R35 R203 R8 R39
53	S25001-47R5SMT	2	SRES,47.5,1206,1%,1/8W,TR,NP	R3 R2
54	S25001-4753SMT	1	SRES,475K,1206,1%,1/8W,TR,NP	R100
55	S25001-1003SMT	10	SRES,100K,1206,1%,1/8W,200PPM,	R55 R111 R49 R108 R115 R124 R142 R208 R207 R106
56	S25001-1213SMT	1	SRES,121K,1206,MF,1%,1/4W	R70
57	S25001-3322SMT	3	SRES,33.2K,1206,1%,1/8W,TR,NP	R63 R65 R233
58	S25001-1000SMT	4	SRES,100,1206,1%,1/8W,TR,NP	R62 R44 R52 R30
59	S25001-2210SMT	5	SRES,221,1206,1%,1/8W,NP	R59 R48 R102 R197 R45
60	S25001-2671SMT	1	SRES,2.67K,1206,1%,1/8W,TR,NP	R109
61	S25001-1502SMT	2	SRES,150K,1206,1%,1/8W,NP	R117 R125
62	S25001-6811SMT	2	SRES,6.81K,1206,1%,1/8W,NP	R127 R130
63	S25001-1500SMT	2	SRES,150,1206,1%,1/8W,TR,NP	R196 R198
64	S25006-10R0	10	SRES,10,	R151 R154 R157 R160 R148 R161 R158 R155 R152 R149
65	S25050-2SMT	5	STRA,2N4403,SO23,TR,(500475),N	Q17 Q16 Q15 Q13 Q14
66	S25051-6SMT	2	STRA,IRLR120N,10A,100V,MOSFET,	Q9 Q10
67	S25050-1SMT	9	STRA,MMBT4401LT,NPN,SOT-23	Q12 Q4 Q7 Q5 Q6 Q1 Q18 Q19 Q20
68	S25051-4SMT	2	STRA,2N7002,TR,NP	Q3 Q2
69	S25051-7SMT	1	SICS,IRF7103,NP	Q11
70	S24020-4	3	CON,4P,TIN,MINI,NP	J5 J11 J2
71	S24020-6	1	CON,6P,TIN,MINI,NP	J9
72	S24020-2	2	CON,2P,TIN,MINI,NP	J10A J10B
73	S18248-10	1	CON,10P,MINI,NP	J3
74	S18248-16	1	CON,16P,MINI,NP	J1
75	S24020-16	2	CON,16P,TIN,MINI,NP	J6 J7
76	S24020-12	1	CON,12P,TIN,MINI,NP	J4
77	S24020-8	1	CON,8P,TIN,MINI,NP (or TH600-265)	J8
78	S20353-4SMT	1	SICS,MAX485ESA,NP	X29
79	S25065-2SMT	1	SICS,74ACT573,OCTAL,TRANS.,LAT	X21
80	S25070-7SMT	1	SICS,TMS320F240PQA,NP	X22
81	S15000-28SMT	4	SICS,HCPL-0601,OPTOCOUPLER	OCI1 OCI2 OCI3 OCI4
82	S20353-5	1	SICS,AN82527	X28
83	S25082-1SMT	1	SXTL,16MHZ,HC40,20PF,NP	Y1
84	S20353-1SMT	1	SICS,MC145407,RECEIVER/DRVR,RS	X16
85	S25067-3SMT	2	SICS,ADG417,SPST,CMOS,SWT,SO8	X13 X31
86	S17900-1SMT	1	74HC245, NEW PACKAGE	X33
87	S15128-13SMT	1	SICS,OP-27G,OPAMP,SO8,TR,NP	X1
88	S15128-18SMT	3	SICS,MC33074,QUAD,OPAMP,SO14,T	X8 X14 X20
89	S25069-3SMT	1	SICS,28F800B5-90,FLASH RO,90n	X25
90	S25069-4SMT	1	SICS,128Kx16,20nS,TSOP	X27
91	M15101-14SMT	1	SICS,MC68332	X24
92	S25068-8SM	1	SICS,MC79L05ABD	X4
93	S25065-3SMT	2	SICS,74VHC14,NP	X10 X30
94	S25057-3SMT	2	SICS,AD8403ARU10	X6 X32
95	M15105-9SMT	1	SICS,7945 X	12
96	S15018-21SMT	2	ICS,MIC4451BM	X2 X3
97	S25067-2SMT	1	SICS,ADG409BR	X15
98	S25070-3SMT	1	ICS,XC9536-15 VQ44	X17
99	S25069-2SMT	1	SICS,25128,SERIAL EEPR,NP	X11
100	S15128-21SMT	2	SICS,LT1016,COMPARATOR	X5 X7
101	S19869-8	1	SWT,78B08S,DIP,SPST,8P,NP	S1
102	S25066-2SMT	1	SICS,AD7862,DUAL,12BIT,250kSPS	X19
103	S25068-7SMT	1	SICS,4.6V,2%,VOLT. DETECTOR,SO	X23
104	S25070-4SMT	1	SICS,XCS20,FPGA	X18
105	S20620-1003	4	RES,100K,AX,5%,1/2W,HI VOLT,TR	R73 R79 R75 R77
106	S25040-12SMT	8	SDIO,MURS320T3,3A,200V,ULTRAFA	D51 D55 D56 D57 D98 D99 D100 D101
107	S25020-SMT	5	SCAP,100pF,0805,COG,100V,5%	C15, C18, C22, C25, C27
108	S25000-1000SMT	6	SRES,100,0805,1%,1/10W	R223, R224, R240, R226, R227, R228
109	T12702-60	2	DIO,1N5358B	DZ3 DZ4
110	T12702-59	2	DIO,1N5333B	DZ1 DZ2
111	S25049-2SMT	4	SDIO,MBRA130LT3,1A,30V,SCHOTKY	D76 D77 D114 D115
112	S25001-3320SMT	6	SRES,332,1206,1%,1/4W	R262 R263 R264 R265 R266 R267
113	S25040-6SMT	6	SDIO,BAV70	D84 D85 D86 D89 D90 D91

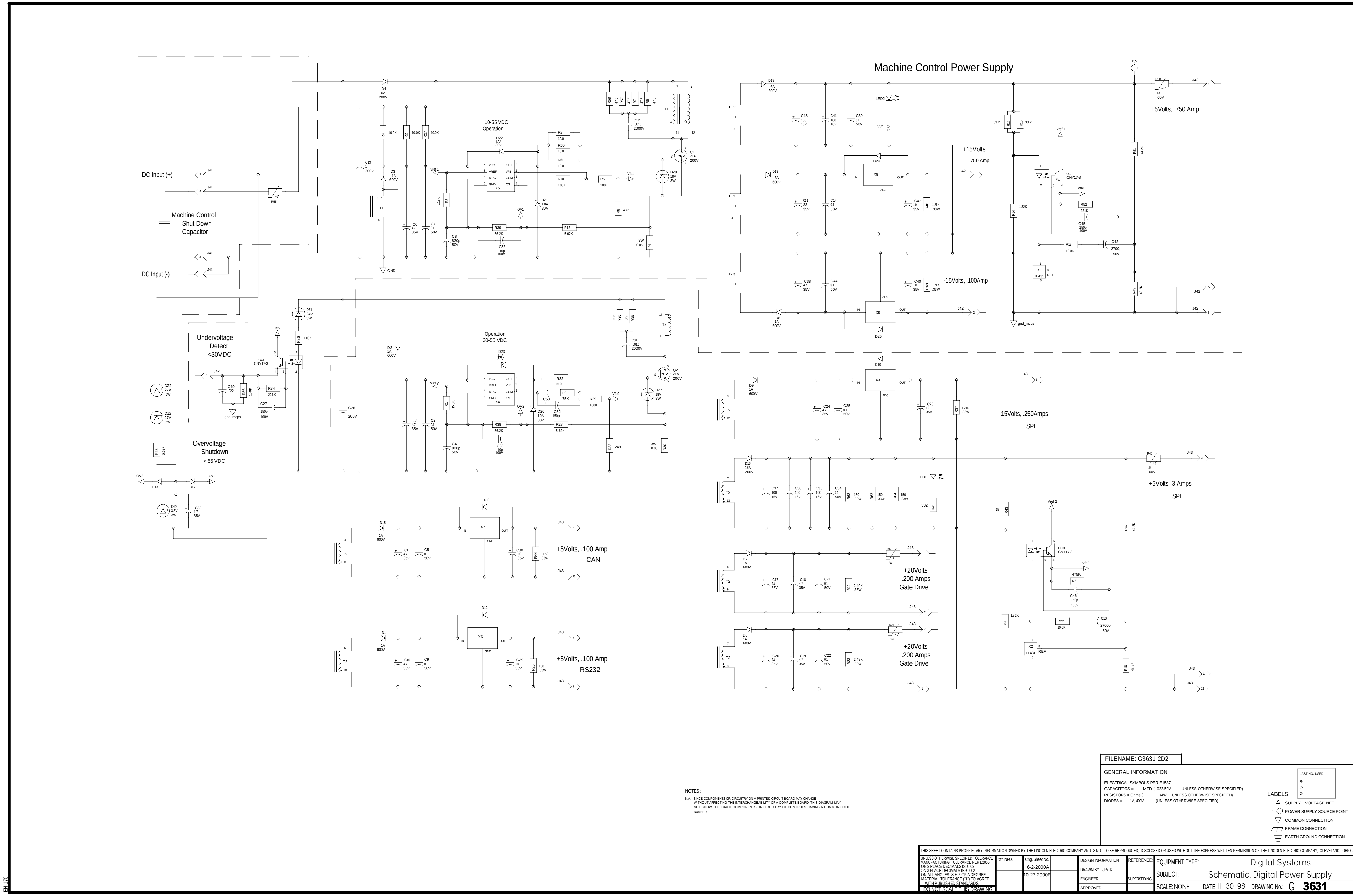
CAPACITORS = MFD/VOLTS
INDUCTANCE = HENRIES
RESISTANCE = OHMS

UNLESS OTHERWISE SPECIFIED TOLERANCE MANUFACTURING TOLERANCE PER E2056 ON 2 PLACE DECIMALS IS ± .02 ON 3 PLACE DECIMALS IS ± .002 ON ALL ANGLES IS ± .5 OF A DEGREE MATERIAL TOLERANCE ("t") TO AGREE WITH PUBLISHED STANDARDS.	Chg. Sheet No. 5-25-2001F	"X" INFO.	DESIGN INFORMATION	REFERENCE:	EQUIPMENT TYPE:	INVERTER WELDERS
			DRAWN BY: F.V.		SUBJECT:	[illegible] AS'BLY
			ENGINEER: T. O'DONNEL	SUPERSEDING:	SCALE: NONE	DATE: 4-96
DO NOT SCALE THIS DRAWING			APPROVED:		DRAWING No.:	L 11088-1D2

NOTE: Lincoln Electric assumes no responsibility for liablilities resulting from board level troubleshooting. PC Board repairs will invalidate your factory warranty. **Individual Printed Circuit Board Components are not available from Lincoln Electric.** This information is provided for reference only. Lincoln Electric discourages board level troubleshooting and repair since it may compromise the quality of the design and may result in danger to the Machine Operator or Technician. Improper PC board repairs could result in damage to the machine.

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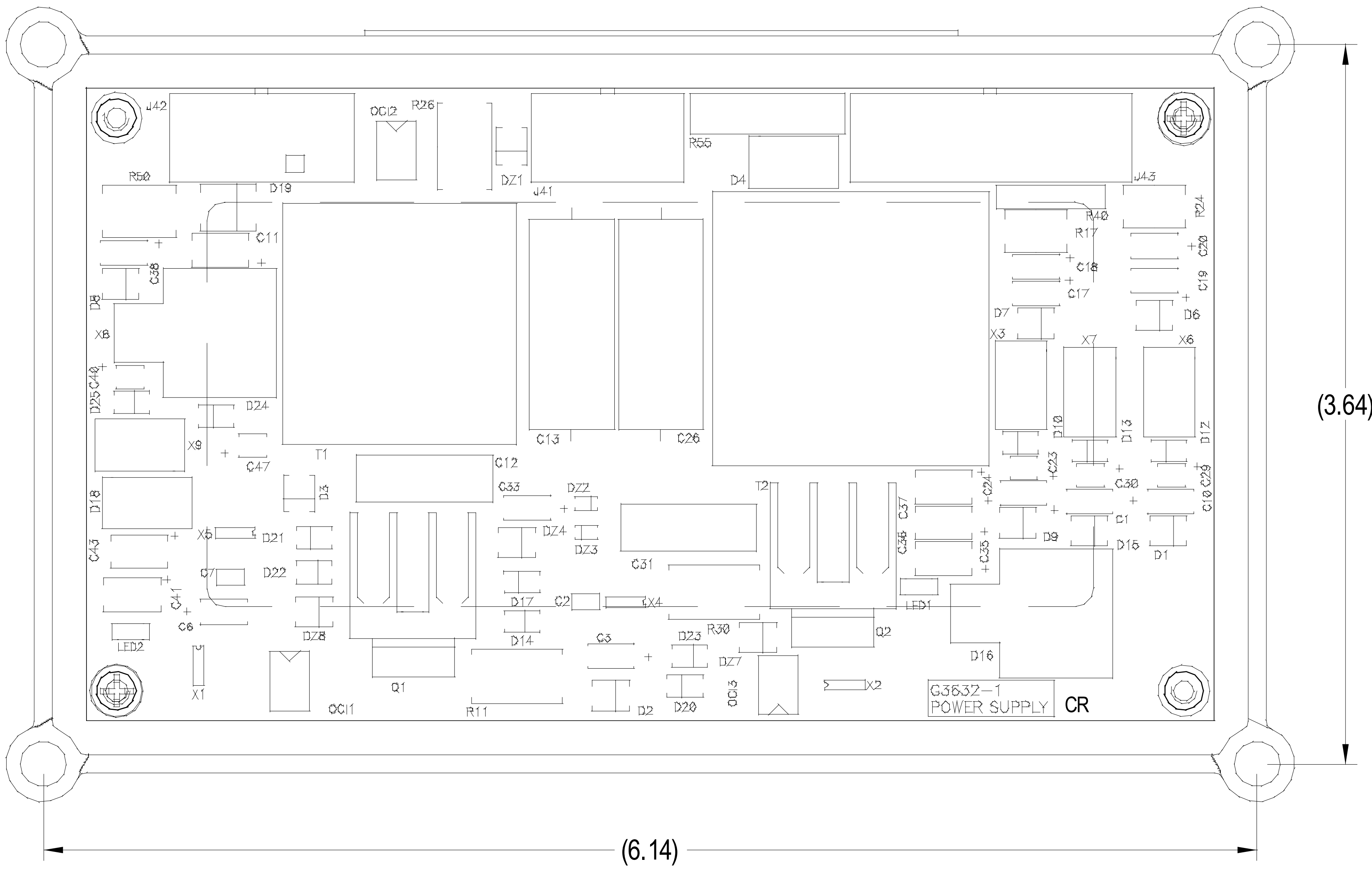
SCHEMATIC - DIGITIAL POWER SUPPLY PC BOARD



NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.

Return to Section TOC
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PC BOARD ASSEMBLY-DIGITAL POWER SUPPLY



ITEM	PART NUMBER	REQ'D.	DESCRIPTION	REFERENCE DESIGNATOR
1	G3632-C	1	POWER PC BOARD BLANK	
2	M19436-3	1	POTTING TRAY	
3	S8025-80	2	SELF TAPPING SCREW	
4	E2527	115g	EPOXY ENCAPSULATIOG RESIN	
5	E2861	AS REQ'D	ELECTRICAL INSULATING COMPOUND	

FOR ITEMS LISTED BELOW REFER TO ELECTRONIC COMPONENT DATABASE FOR COMPONENT SPECIFICATIONS

ITEM	PART NUMBER	QTY.	DESCRIPTION	REFERENCE
6	PCLIN-503-3	1	PCB,MTP,DC POWER ASSY,NP	N/A
7	707W04095	2	SDIO,MURS120T3,NO PRINT	D1 D15
8	A262564400	2	SRES,1.82K,1206,1%,1/8W,NP	R14 R20
9	A262566900	3	SRES,5.62K,1206,1%,1/8W,TR,NP	R12 R28 R45
10	A262569000	6	SRES,10K,1206,1%,1/4W,(09X-007	R4 R13 R22 R2 R27 R56
11	A262576200	2	SRES,56.2K,1206,1%,1/8W,NP(500	R38 R39
12	A262577900	4	SRES,100K,TKF,1206,1%,1/8W,TR,	R5 R10 R21 R29
13	SM100-035	2	SRES,330,1206,5%,1/4W	R41 R53
14	SM100-444	1	SRES,249,1206,1%,1/4W,TR,NP	R33
15	SM100-411	2	SRES,221K,1206,1%,1/8W,TR,NP	R34 R52
16	SM100-420	1	SRES,20,1206,1%,1/8W,TR,NP	R32
17	SM100-440	2	SRES,0.05,1%,2W,TR,NP	R11 R30
18	SM100-441	1	SRES,1K,5%,2W,TR,NP	R26
19	SM100-443	3	SRES,33.2,1206,1%,1/4W,TR,NP	R15 R16 R43
20	SM100-445	2	SRES,43.2K,1206,1%,1/4W,TR,NP	R18 R49
21	SM100-446	2	SRES,44.2K,1206,1%,1/4W,TR,NP	R42 R51
22	SM100-447	1	SRES,THERMISTOR,POS TEMP,TR,NP	R50
23	SM100-448	2	SRES,THERMISTOR,POS TEMP,TR,NP	R17 R24
24	SM200-145	11	SCAP,4.7uF,TAN,35V,20%,TR,NP	C1 C10 C17 C18 C19 C20 C24 C33 C38 C3 C6
25	SM200-183	3	SCAP,150pF,0805,50V,COG,5%,TR,	C27 C45 C46
26	SM200-188	5	SCAP,1uF,TAN,3528,35V,TR,NP	C23 C29 C30 C40 C47
27	SM200-192	2	SCAP,820pF,0805,50V,COG,5%,TR,	C4 C8
28	SM200-193	2	SCAP,2700pF,0805,5OV,X7R,5%,TR	C16 C42
29	SM200-194	11	SCAP,0.1uF,0805,50V,X7R,10%,TR	C2 C5 C7 C9 C14 C21 C22 C25 C34 C39 C44
30	SM200-200	2	SCAP,10pF,CER,0805,100V,5%,TR,	C28 C32
31	SM200-201	1	SCAP,33uF,TAN,7343,25V,10%,TR,LOW ESR	C11
32	SM200-202	5	SCAP,100uF,TAN,7343,10V,20%,TR	C35 C36 C37 C41 C43
33	SM550-079	7	SDIO,1A,400V,DO-214BA,GLS,NP	D10 D12 D13 D14 D17 D24 D25
34	SM550-109	2	SLED,RED,1206,TR,NP	LED1 LED2
35	SM550-122	2	SDIO,MURD620CT,6A,200V,ULTRA-F	D4 D18 D16
36	SM550-123	4	SDIO,MBRA130LT3,1A,30V,SCHOTTK	D20 D21 D22 D23
37	SM550-148	1	SDIO,MURB1620CT,16A,200V	D16
38	SM550-149	1	SDIO,1SMB5934BT3,24V,3W	DZ1
39	SM550-125	2	SDIO,MMSZ5254BT1,0.5W,27V,5%,T	DZ2 DZ3
40	SM550-126	1	SDIO,1SMB5913BT3,3W,3.3V,5%,TR	DZ4
41	SM550-128	2	SDIO,1SMB5931BT3,3W,18V,5%,TR,	DZ7 DZ8
42	703W31526	1	SRES,15K,FXD,1206,1%,1/8W,TR	R1
43	A262567400	1	SRES,6.19K,1206,1%,1/8W,TR,NP	R3
44	SM550-104	6	SDIO,MURS160,1A,600V,FAST RECO	D2 D3 D6 D7 D8 D9
45	A287245100	2	SICS,TL4311D,LIN,V-REF,36V,-40	X1 X2
46	SM800-299	2	SICS,PWM CONTROLLER,I-MODE,NP	X4 X5
47	SM800-297	2	SICS,MC78M05,V-REG,100mA,5V,NP	X6 X7
48	707W03410	3	TRA,CNY17-3,NP	OCI1 OCI2 OCI3
49	HW900-379	2	HSS,MTP,VERT MOUNT,TO220,NP	Q1,Q2 HEATSINKS
50	TH100-160	1	RES,THERMISTOR,PTC,POS TEMP,TR	R40
51	TH100-161	1	RES,THERMISTOR,NTC,NEG TEMP,NP	R55
52	TH200-132	2	CAP,1uF,PEMF,200V,10%,NP	C13 C26
53	TH300-023-A	1	TFM,L-5763-3,FLYBACK,NP	T1
54	TH300-024-A	1	TFM,L-5764-3,FLYBACK,NP	T2
55	TH400-053	2	TRA,BUZ30A,NMF,21A,200V,T0220,	Q1 Q2
56	TH600-263	1	CON,4P,TIN,MINI,NP	J41
57	TH600-264	1	CON,6P,TIN,MINI,NP	J42
58	TH600-266	1	CON,12P,TIN,MINI,NP	J43
59	PPW-11110-1	2	SCREW	N/A
60	PPW-11160-1	2	WASHER	N/A
61	707W04224	1	SDIO,MURS360T3,NP	D19
62	TH200-219	2	CAP, 1500pF,200V,MET POLYPROP	C12,31
63	SM200-220	1	SCAP,0.022uF,50v, X7R	C49
64	SM200-221	1	SCAP,330pF,0805,50V,5%, COG	C52
65	SM200-522	4	SRES,47.5,1210,5%,1/2W,TR,NP	R6 R7 R57 R58
66	703W01044	3	SRES,10,TKF,0805,1%,1/10W	R9 R60 R61
67	SM100-523	2	SRES,30.1,FXD,1210,5%,1/2W,TR	R35 R36
68	SM400-057	1	STRA,78M15C,DPACK	X3
69	SM400-058	1	STRA,7815C,DPACK	X8
70	SM400-059	1	STRA,79M15C,DPACK	X9
71	SM100-524	2	SRES,2.49K,1210,5%,1/2W,T/R	R19 R23
72	SM100-525	3	SRES,1.21K,1210,5%,1/2W,TR,NP	R46 R48 R37
73	SM100-526	2	SRES,150,1210,5%,1/2W,TR,NP	R25 R44
74	SM100-409	1	SRES,475,1206	R8
75	SM900-001	2	SHSS,MTP,D2PACK,TO263	X8,D16 HEATSINKS
76	9P7951	AS REQ'D	THERMAL JOINT COMPOUND	N/A
77	SM200-194	1	SCAP,0.1uF,0805,50V,X7R,10%,TR	C53
78	A262577600	1	SRES,75K,TKF,1206,1%,1/8W,TR,	R31
79	SM100-526	1	SRES,150,1210,5%,1/2W,TR,NP	R62, R63, R64

CAPACITORS = MFD/VOLTS
INDUCTANCE = HENRIES
RESISTANCE = OHMS

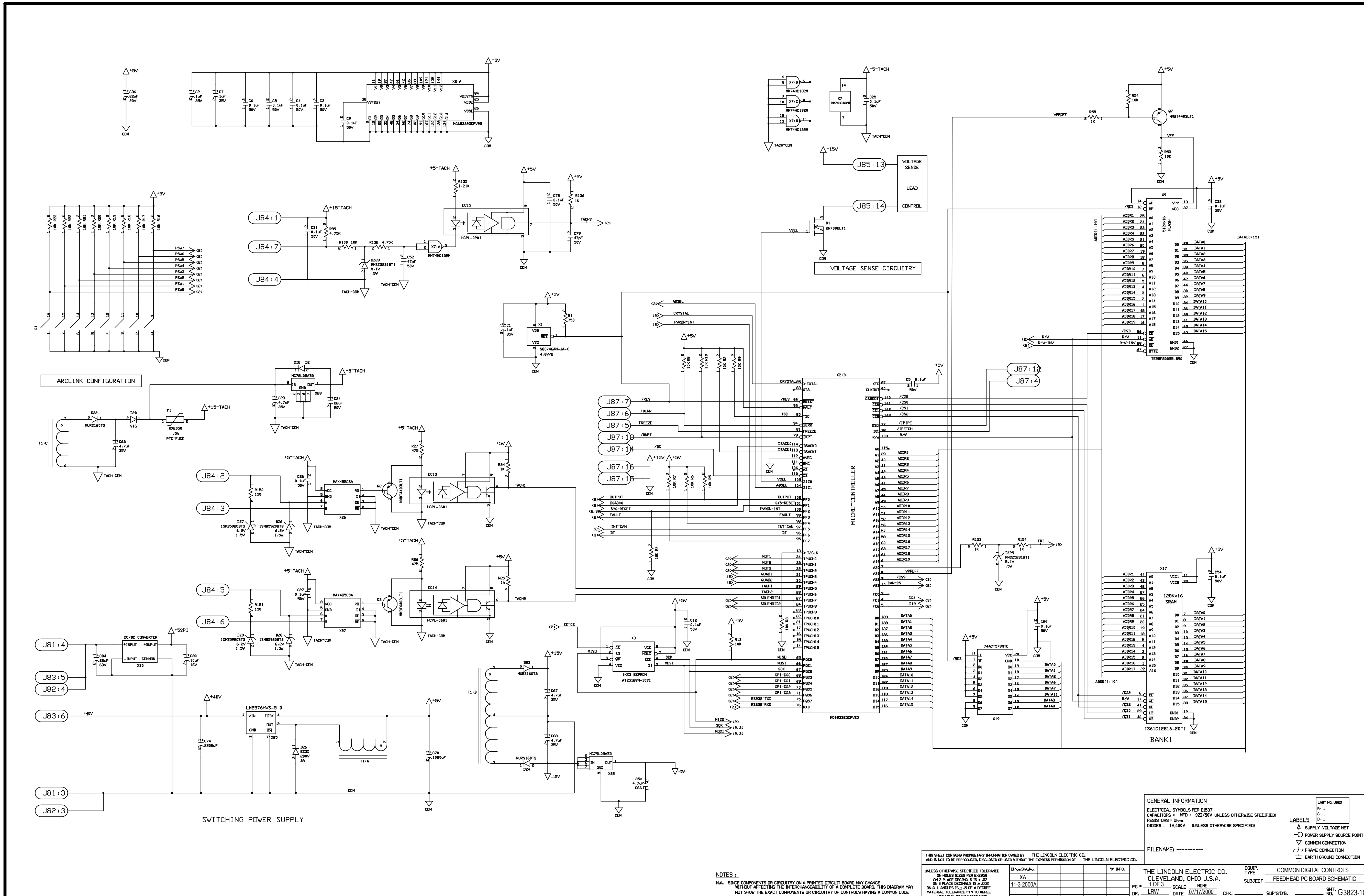
INVERTER WELDERS
DIGITAL POWER P.C. BOARD AS'BLY
6-2-2000A

G3632-1

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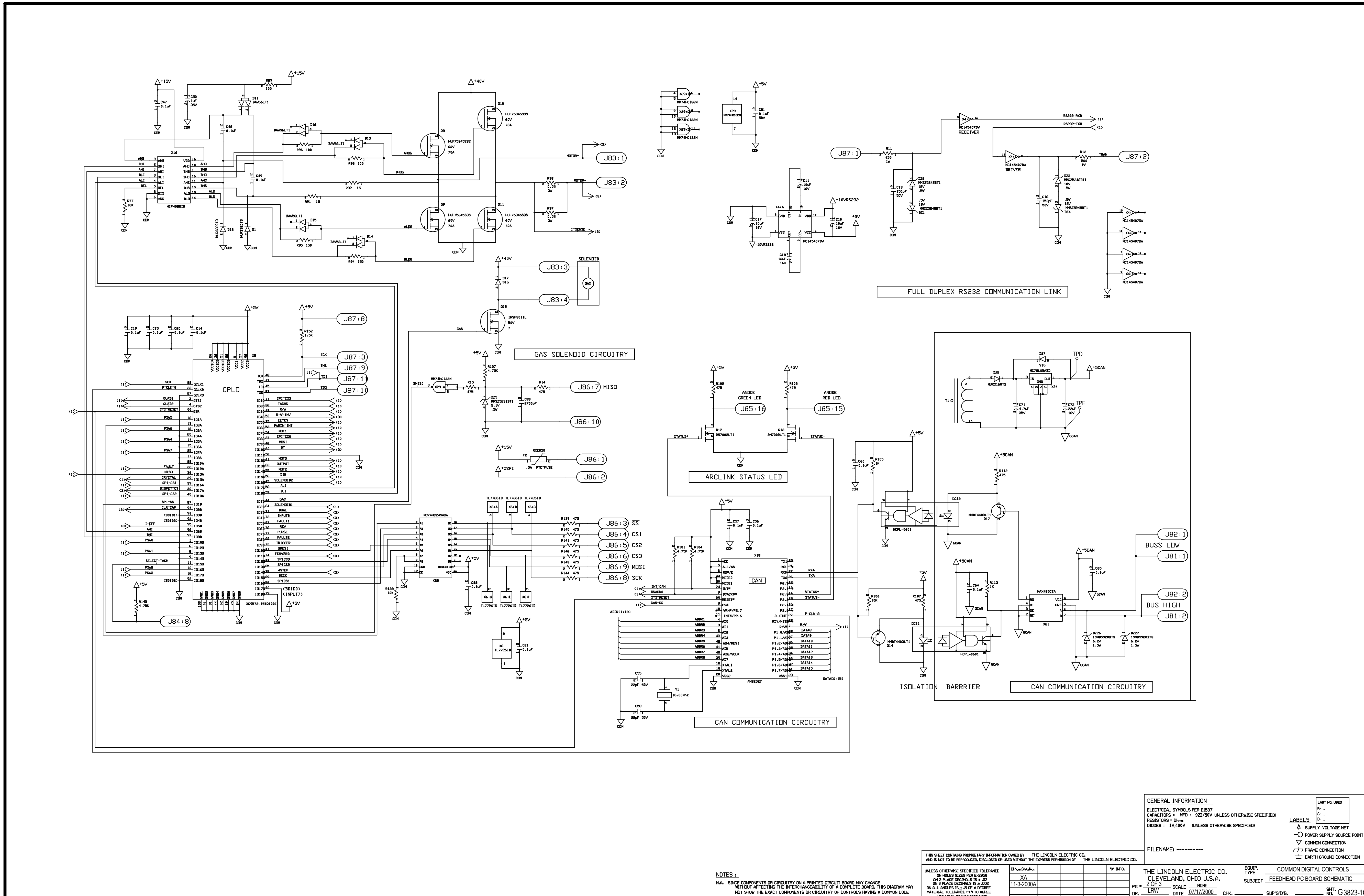
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SCHEMATIC - FEEDHEAD PC BOARD #1



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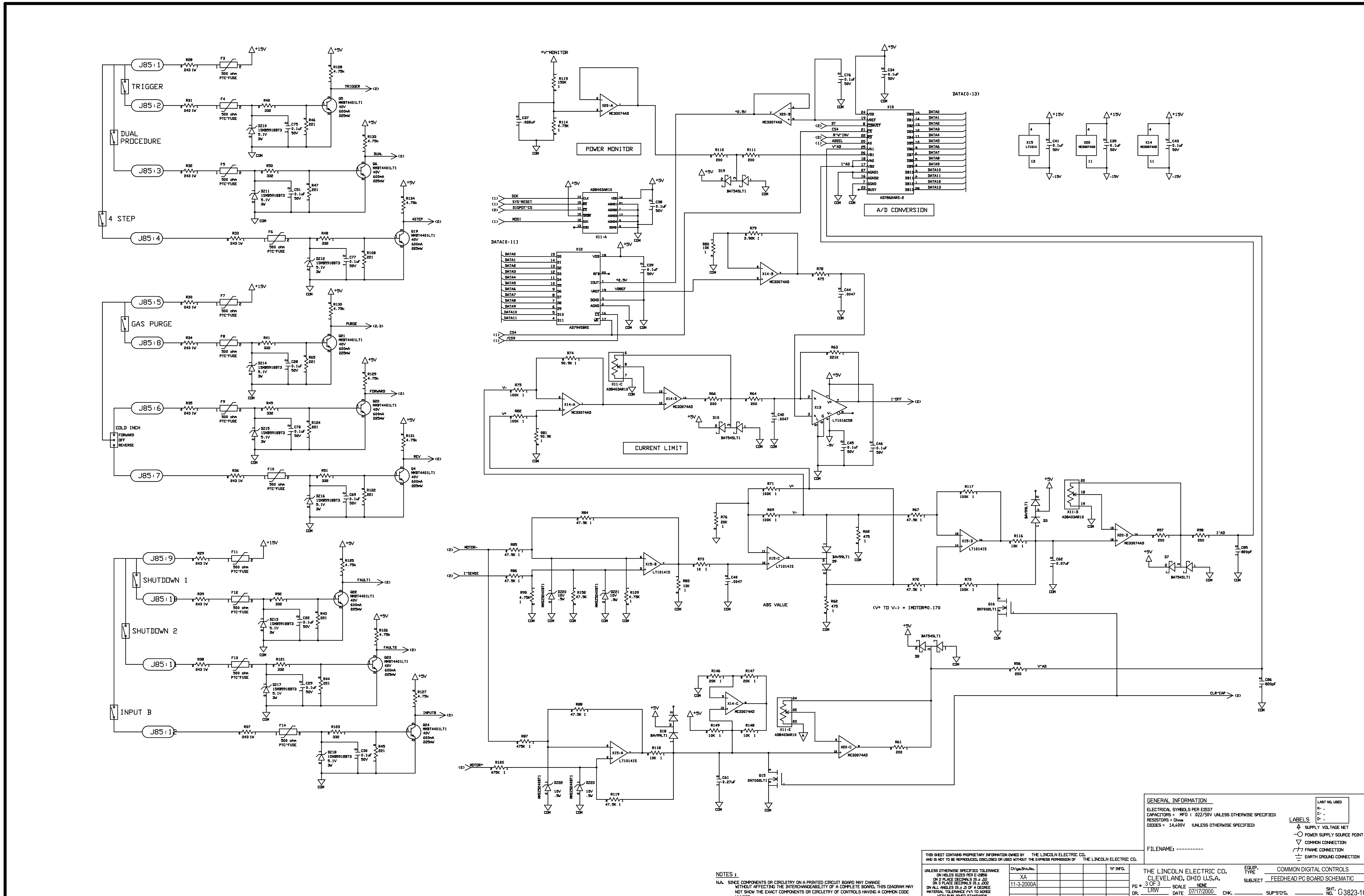
SCHEMATIC- FEEDHEAD PC BOARD #2



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SCHEMATIC- FEEDHEAD PC BOARD #3

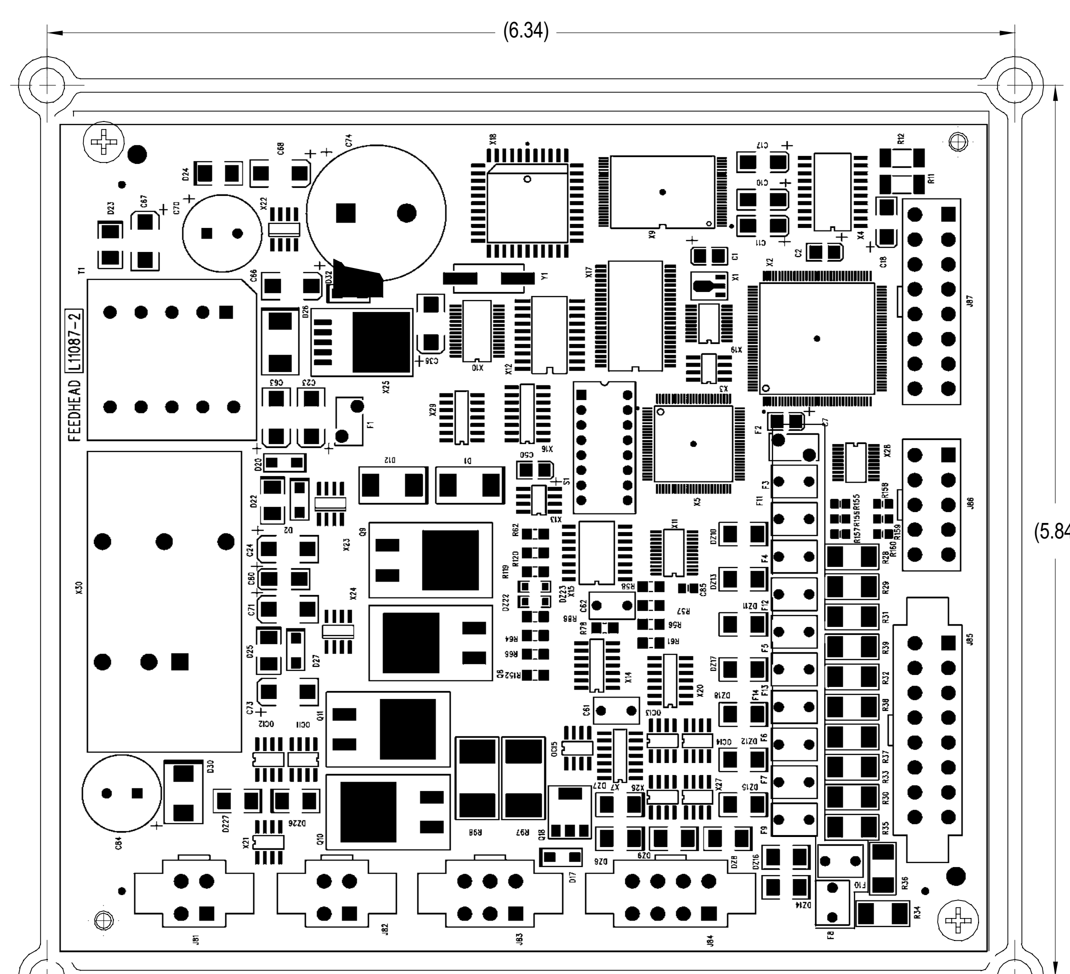


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Return to Section TOC
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PC BOARD ASSEMBLY-FEEDHEAD

ITEM	PART NO.	QTY	PC BOARD REFERENCE DESIGNATORS	DESCRIPTION
1	G3822-D	1		FEED HEAD PC BOARD BLANK
2	M19436-5	1		POTTING TRAY
3	S8025-80	2		SELF TAPPING SCREW
4	E2527	195g 6.88 OZ.		EPOXY ENCAPSULATING RESIN
5	E3539	AS REQ.		ELECTRICAL INSULATING COMPOUND
N.D. 6	S24822-2	1	X5	SOFTWARE,CPLD
N.E. 7	S24823-2	1	X9	SOFTWARE,FLASH
FOR ITEMS LISTED BELOW REFER TO ELECTRONIC COMPONENT DATABASE FOR COMPONENT SPECIFICATIONS				
8	S25024-2SMT	4	C1,C2,C7,C50	SCAP,1uF,TAN,3528,35V,TR,NP
9	S25020-3SMT	47	C3,C4,C5,C6,C8,C9,C12,C14, C15,C19,C20,C22,C25, C26,C27,C28,C29,C30,C31, C32,C34,C35,C38,C39,C41, C43,C45,C46,C47,C48,C49, C51,C54,C56,C57,C59,C60, C64,C65,C69,C72,C75,C76, C77,C78,C81,C82	SCAP,0.1uF,0805,50V,X7R,10%,TR
10	S25024-8SMT	5	C10,C11,C17,C18,C80	SCAP,10uF,TAN,6032,16V,10%,TR,NP
11	S25020-13SMT	2	C13,C16	SCAP,150pF,CER,0805,100V,COG,5%,TR,NP
12	S25024-5SMT	6	C23,C63,C66,C67,C68,C71	SCAP,4.7uF,TAN,7343,35V,10%,TR,NP
13	S25024-10SMT	3	C24,C36,C73	SCAP,22uF,TAN,7343,25V,10%,POLAR,TR
14	S25020-2SMT	1	C37	SCAP,0.022uF,0805,50V,X7R,10%,
15	S25020-10SMT	3	C40,C42,C44	SCAP,4700pF,0805,50V,X7R,10%,T
16	S25020-9SMT	2	C52,C79	SCAP,47pF,0805,50V,COG,5%,TR,N
17	S25020-15SMT	3	C55,C58,C83	SCAP,22pF,0805,50V,COG,5%,TR,N
18	S24833-1	2	C61,C62	CAP,0.27uF,PCF,63V,5%,TR,NP
19	S13490-179	1	C70	CAP,1000uF,ALU,35V,20%,NP
20	S13490-182	1	C74	CAP,3300uF,ALU,63V,20%,NP
21	S13490-184	1	C84	CAP,330uF,100V
22	S25020-4SMT	2	C85,C86	CAPACITOR ,SMD CERAMIC,820PF,50V,5%COG,S0805
23	S25040-12SMT	2	D1,D12	SDIO,MURS320T3,3A,200V,ULTRAFA
24	S25040-2SMT	4	D2,D17,D20,D27	SDIO,400V,0.8A,NP
25	S25040-5SMT	10	D3,D4,D5,D6,D9,D18,D21,D28,D29, D31	SDIO,BAV99LT1,SOT23,DUAL SWITC
26	S25049-4SMT	4	D7,D8,D10,D19	SDIO,BAT54S,DUAL/SERIES,30V,20
27	S25040-4SMT	5	D11,D13,D14,D15,D16	SDIO,BAW56LT1,SOT23,DUAL SWT,T
28	S25040-11SMT	4	D22,D23,D24,D25	SDIO,MURS160,1A,600V,FAST RECO
29	S25040-9SMT	1	D26	SDIO,3A,200V,D0-214AB,UFR
30	S25040-10SMT	1	D30	DIODE,SMD,3A,400V
31	S25046-3SMT	4	DZ1,DZ2,DZ3,DZ4	SDIO,MMSZ5248B,18V,ZENER,TR,NP
32	S25046-1SMT	3	DZ5,DZ28,DZ29	SDIO,MMSZ5231BT1,5.1V,NP
33	S25044-9SMT	6	DZ6,DZ7,DZ8,DZ9,DZ26,DZ27	SDIO,1SMB5920BT3,6.2V,NP
34	S25044-1SMT	9	DZ10,DZ11,DZ12,DZ13,DZ14, DZ15,DZ16,DZ17,DZ18	SDIO,1SMB5918BT3,3W,5.1V,5%,TR,NP
35	S25046-2SMT	4	DZ20,DZ21,DZ22,DZ23	SDIO,MMSZ5240BT1,10V,500mW,ZEN
36	S18380-5	2	F1,F2	RES,50,VAR,PTC,NP
37	S18380-14	12	F3,F4,F5,F6,F7,F8,F9,F10, F11,F12,F13,F14	RES,500,PTC,265V
38	S24020-4	2	J81,J82	CON,MOLEX,15-97-7042,MINI,PCB,4 PIN,TIN
39	S24020-6	1	J83	CON,MOLEX,15-97-7062,MINI,PCB,6 PIN,TIN
40	S24020-8	1	J84	CON,MOLEX,15-97-7082,MINI,PCB,8 PIN,TIN
41	S24020-16	1	J85	CON,MOLEX,15-97-7162,MINI,PCB,16 PIN,TIN
42	S18248-10	1	J86	CON,10P,MINI,NP
43	S18248-16	1	J87	CON,MOLEX,39-28-1163,PCB,16 PIN,TIN
44	S15000-28SMT	4	OCI1,OCI2,OCI3,OCI4	SICS,Optocoupler, HCPL-0601 (SO-8)
45	S15000-26SMT	1	OCI5	SICS,HCPL-0201,OPTOCOUPLE
46	S25051-4SMT	5	Q1,Q12,Q13,Q15,Q16	STRA,2N7002,TR,NP, (SM400-020)
47	S25050-2SMT	5	Q2,Q3,Q7,Q14,Q17	STRA,2N4403,SO23,TR,(500475),N
48	S25050-1SMT	9	Q4,Q5,Q6,Q19,Q20,Q21,Q22,Q23,Q2 4	STRA,2N4401,SOT-23,NPN,TR,
49	S25051-5SMT	4	Q8,Q9,Q10,Q11	STRA,75A,55V,0.007 OHM FET,N-CHAN
50	S23060-1SMT	1	Q18	IC,SMD,SWITCH,LO-SIDE,2.2A60V,
51	S25000-1002SMT	24	R2,R3,R4,R5,R6,R7,R9,R16, R17,R18,R19,R20,R21,R22, R23,R53,R54,R77,R80,R106, R116,R138,R148,R149	SRES,10K,0805,1%,1/10W,TR,NP
52	S25001-1002SMT	6	R8,R10,R13,R83,R100,R118	SRES,10K,MF,1206,1%,1/8W,TR
53	S25001-4752	4	R84,R85,R86,R152	RESISTOR,SMD,47.5K,1/4W,1206,1%
54	S25003-2000SMT	2	R11,R12	SRES,200,2512,5%,1W,TR,NP
55	S25001-4750SMT	9	R14,R15,R62,R68,R78,R102, R103,R107,R112	SRES,475,1206,1%,1/8W,TR,NP
56	S25000-1001SMT	8	R24,R25,R55,R105,R113, R136,R153,R154	SRES,1K,0805,1%,1/10W,TR,NP
57	S25000-4750SMT	2	R26,R27	SRES,475,0805,1%,TR,NP
58	S25004-2430SMT	12	R28,R29,R30,R31,R32,R33, R34,R35,R36,R37,R38,R39	SRES,243,WSC-1,1%,1W,TR,NP
59	S25000-3320SMT	9	R41,R42,R48,R49,R50,R51, R52,R121,R123	SRES,332,0805,1%,1/10W,TR,NP
60	S25000-2210SMT	9	R43,R44,R45,R46,R47,R65, R108,R122,R124	SRES,221,TKF,0805,1%,1/10W,TR
61	S25001-2000SMT	8	R56,R57,R58,R61,R64,R66, R110,R111	SRES,200,1206,1%,1/8W,TR,NP
62	S25001-7500SMT	1	R1	RESISTOR,SMD,750ohms,1/4W,1206,1%
63	S25000-2213SMT	1	R63	SRES,221K,TKF,0805,1%,01/10W,TR
64	S25000-4752SMT	2	R67,R72	SRES,47.5K,TKF,0805,1%,01/10W,TR
65	S25000-1003SMT	6	R69,R71,R73,R75,R82,R117	SRES,100K,TKF,0805,1%,01/10W,TR
66	S25001-1001SMT	1	R70	SRES,1K,1206,1%,1/8W,TR,NP,(09
67	S25000-9092SMT	2	R74,R81	SRES,90.9K,TKF,0805,1%,1/10W
68	S25000-3921SMT	1	R79	SRES,3.92K,TKF,0805,1%,1/10W,TR
69	S25001-4753SMT	2	R87,R120	SRES,475K,1206,1%,1/8W,TR,NP
70	S25001-4752SMT	2	R88,R119	SRES,47.5K,1206,1%,1/8W,TR,NP
71	S25001-1000SMT	9	R89,R93,R96,R155,R156,R157,	SRES,100,1206,1%,1/8W,TR,NP
72	S25001-15R0SMT	2	R91,R92	SRES,15,1206,1%,1/8W,TR,NP
73	S25001-1500SMT	4	R94,R95,R150,R151	SRES,150,1206,1%,1/8W,TR,NP
74	S25001-3320SMT	6	R139,R140,R141,R142,R143,R144	RESISTOR,SMD,332ohms,1/4W,1206,1%
75	S25005-1SMT	2	R97,R98	SRES,0.05,3W,1%,TR,NP
76	S25001-4751SMT	4	R99,R114,R132,R137	SRES,4.75K,1206,1%,1/8W,NP,(SM
77	S25000-4751SMT	14	R101,R104,R125,R126,R127, R128,R129,R130,R131,R133, R134,R145,R90,R109	SRES,4.75K,0805,1%,TR,NP
78	S25001-1503SMT	1	R115	SRES,150K,1206,1%,1/8W,NP
79	S25000-1211SMT	1	R135	SRES,1.21K,0805,1%,1/10W,TR,NP
80	S25000-2002SMT	3	R146,R147,R76	SRES,20K,TKF,0805,1%,01/10W,TR
81	S25000-1002SMT	24	R2,R3,R4,R5,R6,R7,R9,R16,R17, R18,R19,R20,R21,R22,R23,R53, R54,R77,R80,R106,R116,R138, R148,R149	RESISTOR,SMD,METAL FILM,1/10W,10.0K,1%
82	S19869-8	1	S1	SWT,78B08S,DIP,SPST,8P,NP
83	S20375-8	1	T1	TFM,L5936,Noreast,Switching Pwr
84	S25068-7SMT	1	X1	SICS,4.6V,2%,VOLT. DETECTOR
85	M15101-14SMT	1	X2	SICS,MC68332,MICRCONTROLLER,TQ
86	S25069-2SMT	1	X3	SICS,25128,SERIAL EEPR,NP
87	S20353-1SMT	1	X4	SICS,MC145407,RECEIVER/DRVR,RS
88	S25070-6SMT	1	X5	SICS,XC9572-15,CPLD,TQ100,NP
89	S17900-24SMT	1	X7,X29	SICS,74HC132,NP
90	S25069-3SMT	1	X9	SICS,28F800B5B90,FLASH ROM,90n
91	S25066-2SMT	1	X10	SICS,AD7862,DUAL,12BIT,250kSPS
92	S25057-3SMT	1	X11	SICS,AD8403ARU10,DIGITAL POT,NP
93	M15105-9SMT	1	X12	SICS,AD7945,12BIT,PARALLEL,DAC
94	S15128-21SMT	1	X13	SICS,LT1016,COMPARATOR,NP
95	S15128-18SMT	2	X14,X20	SICS,MC33074,QUAD,OPAMP,S014,T
96	S15128-16SMT	1	X15	ICS,SMD,OP-AMP,QUAD,HIGH PERFORMANCE 1014
97	S15018-20SMT	1	X16	SICS,HIP4082,H-BRIDGE,FET DRIVE
98	S25069-4SMT	1	X17	SICS,128Kx16,20nS,TSOP(II)
99	S20353-5	1	X18	SICS,AN82527,CAN CONTROLLER,PL
100	S25065-2SMT	1	X19	SICS,74ACT573,OCTAL,TRANS. LAT
101	S20353-4SMT	3	X21,X26,X27	SICS,MAX485,TRANSCEIVER,NP
102	S25068-8SMT	1	X22	SICS,79L05,V-REG,-5V,SO8
103	S25068-6SMT	2	X23,X24	SICS,78L05,V-REG,+5V,SO8
104	S15128-25SMT	1	X25	SICS,LM2576HVS-5.0,VREG,60V,SWI
105	S17900-11SMT	1	X28	SICS,74HC245,SOL20,HCMOS,NP
106	S24841-1	1	X30	ICS,DC/DC,5V 3A OUT,36-75V IN
107	S25082-1SMT	1	Y1	SXTL,16MHz,HC40,20pF,NP



UNLESS OTHERWISE SPECIFIED:
RESISTANCE = OHMS

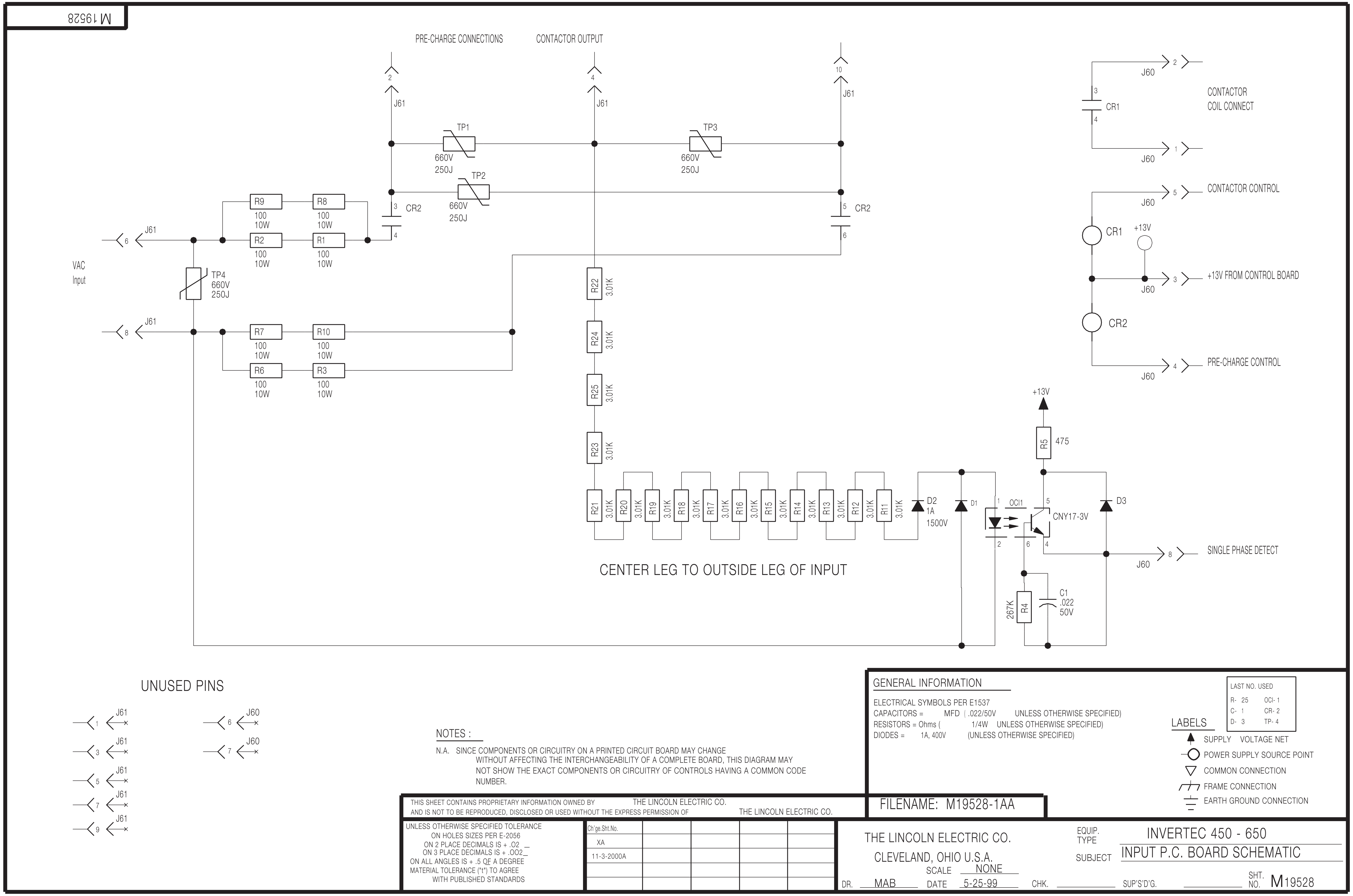
COMMON DIGITAL CONTROLS
FEED HEAD PC BOARD ASSEMBLY
4-20-2001C

L11087-2

NOTE: Lincoln Electric assumes no responsibility for liablilities resulting from board level troubleshooting. PC Board repairs will invalidate your factory warranty. **Individual Printed Circuit Board Components are not available from Lincoln Electric.** This information is provided for reference only. Lincoln Electric discourages board level troubleshooting and repair since it may compromise the quality of the design and may result in danger to the Machine Operator or Technician. Improper PC board repairs could result in damage to the machine.

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SCHEMATIC - INPUT PC BOARD

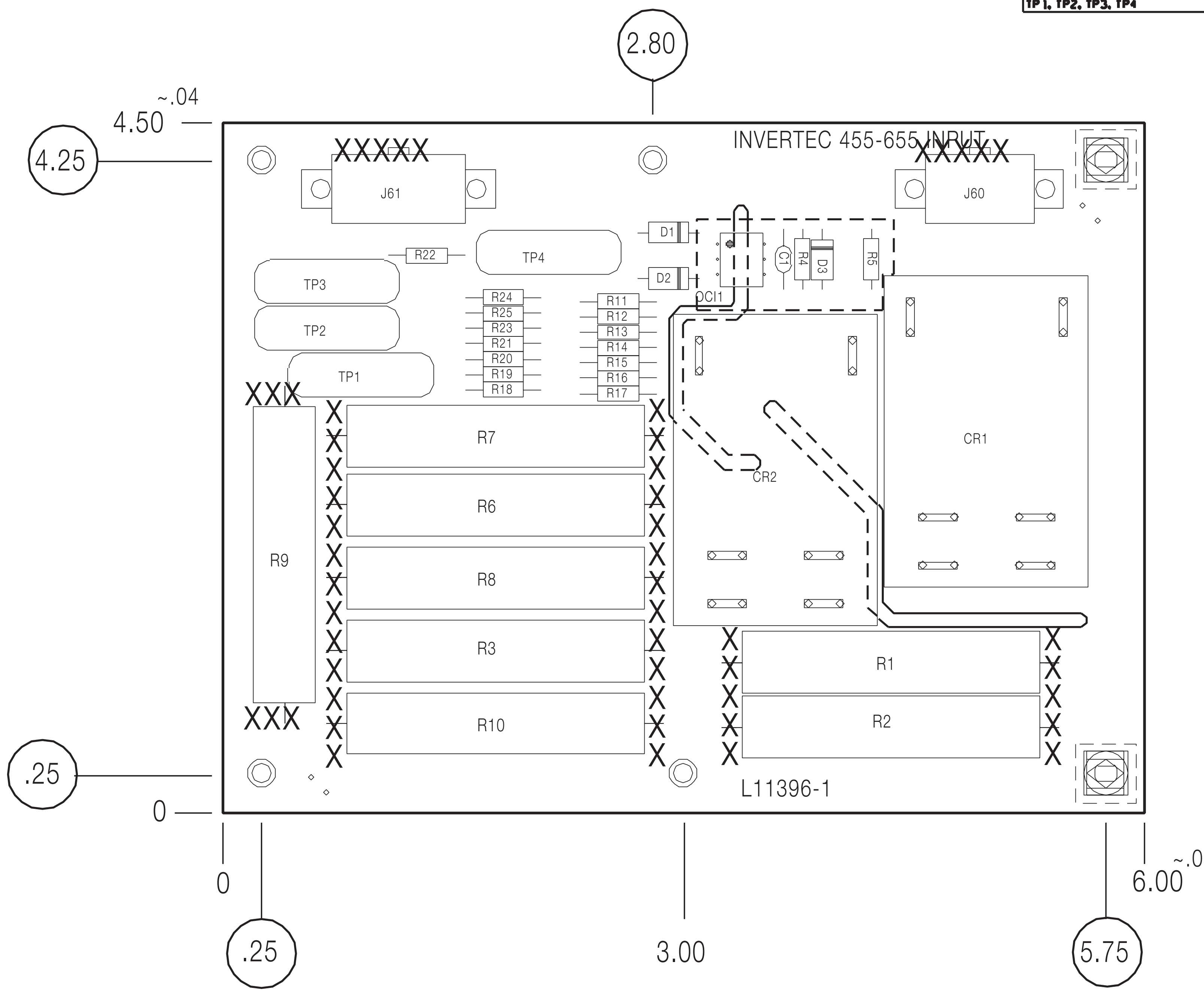


NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.

PC BOARD ASSEMBLY-INPUT

ITEM	REQ'D	PART NO.	IDENTIFICATION
C1	1	S16668-5	.022/50
CR1, CR2	2	S14293-18	DPST RELAY
D1, D3	2	T12199-1	1N4004
D2	1	T12705-58	DIODE, 1.0A, 1500V
J60	1	S24020-8	HEADER
J61	1	S24020-10	HEADER
OCI1	1	S15000-22	OPTO ISOLATOR
R1, R2, R3, R6, R7, R8, R9, R10	8	S24376-3	100/10W
R4	1	S19400-2673	267K 1/4W
R5	1	S19400-4750	475 1/4W
R11, R12, R13, R14, R15, R16 R17, R18, R19, R20, R21, R22 R23, R24, R25	15	S19400-3011	3.01K 1/4W
TP1, TP2, TP3, TP4	4	T13640-23	MOV, 250J, 660V

RESISTORS = OHMS/WATTS
CAPACITORS = MFD/VOLTS



INVERTER WELDERS

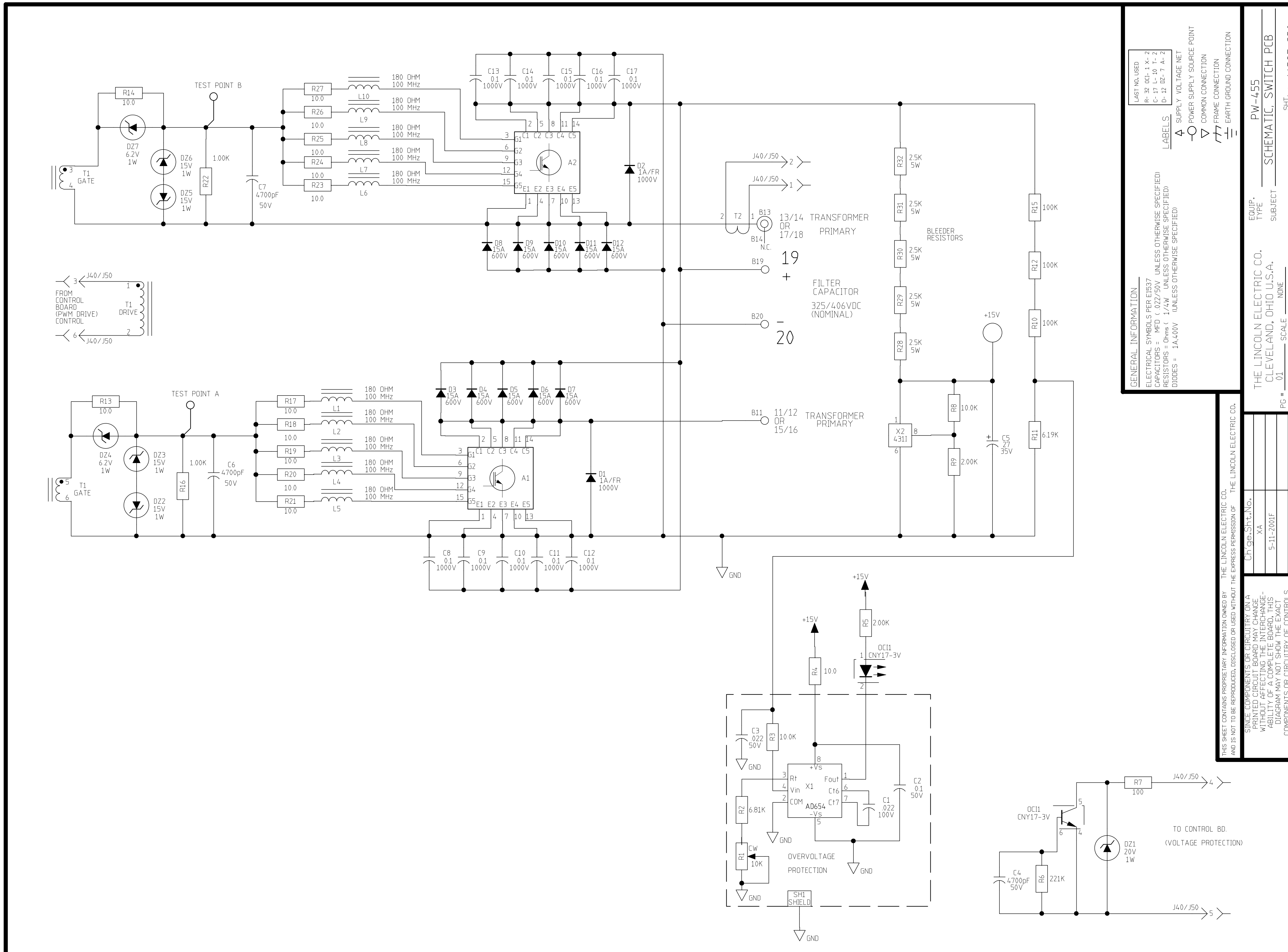
INPUT P.C. BOARD ASSEMBLY

L11396-1

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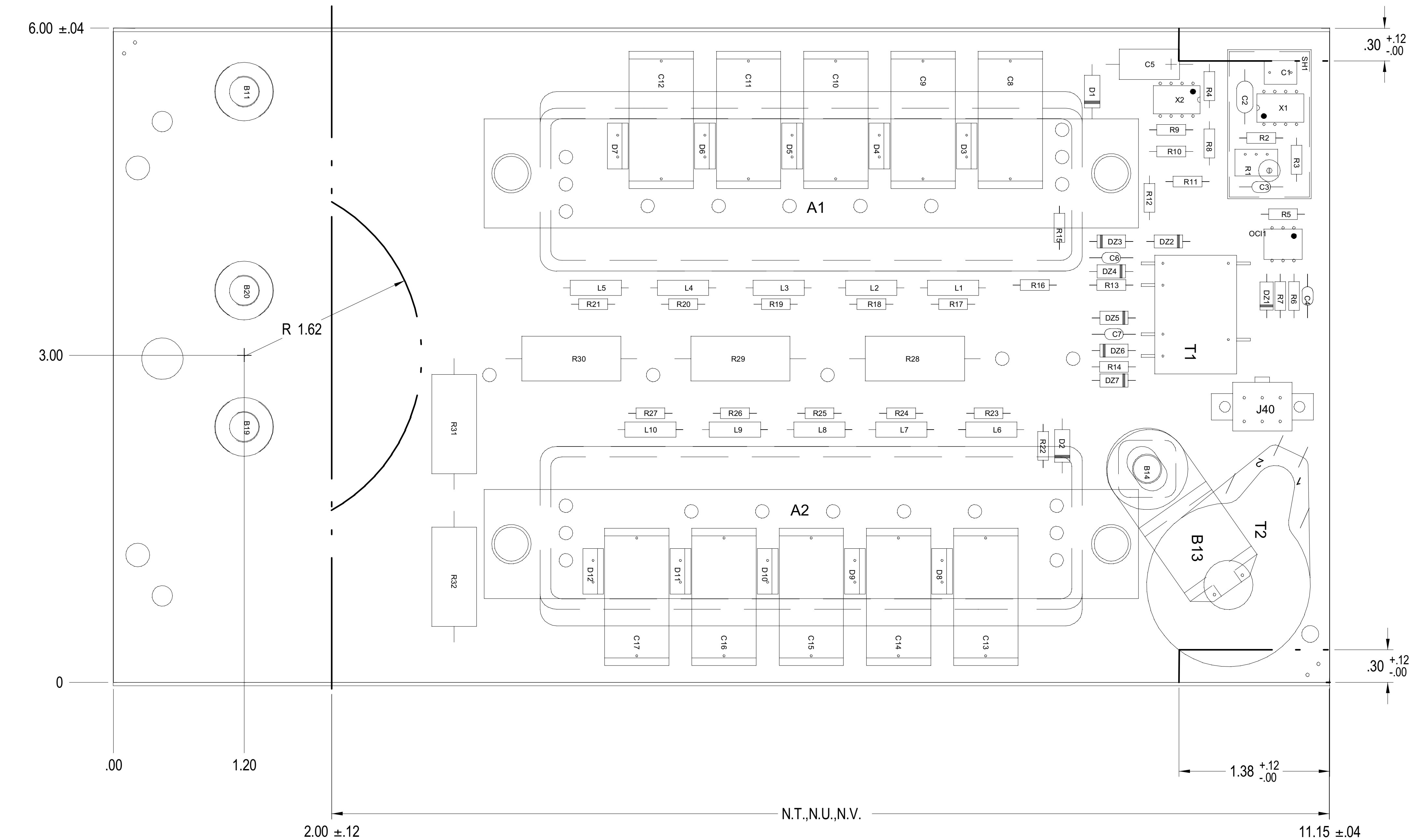
SCHEMATIC -SWITCH PC BOARD



NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.

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PC BOARD ASSEMBLY-SWITCH



ITEM	REQ'D	PART NO	IDENTIFICATION
C1	1	S2 0500-14	CAPACITOR,PPMF,.022,100V,BOX,5%
C2	1	S16668-11	CAPACITOR,CEMO,0.1, 50V,10%
C3	1	S16668-5	CAPACITOR,CEMO,.022, 50V,20%
C4,C6,C7	3	S16668-6	CAPACITOR,CEMO,4700p,50V,10%
C5	1	S13490-93	CAPACITOR,TAEL,27,35V,10%
C8,C9,C10,C11,C12,C13,C14 C15,C16,C17	10	S20500-1	CAPACITOR,PPMF,0.1,1000V,10%,BOX
D1,D2	2	T12705-44	DIODE,AXLDS,1A,1000V,FR, 818
D3,D4,D5,D6,D7,D8,D9,D10 D11,D12	10	T12705-32	DIODE,T220,15A,600V,FR,MUR1560
DZ1	1	T12702-4	ZENER DIODE, 1W,20V,5% 1N4747A
DZ2,DZ3,DZ5,DZ6	4	T12702-29	ZENER DIODE, 1W,15V,5% 1N4744A
DZ4,DZ7	2	T12702-40	ZENER DIODE, 1W,6.2V,5% 1N4735A
J40	1	S24020-6	CONNECTOR,MOLEX,MINI,PCB,6-PIN,TIN
L1,L2,L3,L4,L5,L6,L7,L8,L9 L10	10	T 12218-15	CHOKE,RF,FERRITE BEAD,180 OHM
OCI1	1	S15000-22	OPTOCOUPLER,PHOTO-Q,70V,CNY17-3/VDE
R1	1	S16296-5	TRIMMER,MT,1/2W,10K, 10%,LINEAR
R2	1	S19400-6811	RESISTOR,MF,1/4W,6.81K,1%
R3,R8	2	S19400-1002	RESISTOR,MF,1/4W,10.0K,1%
R4,R13,R14,R17,R18,R19,R20 R21,R23,R24,R25,R26,R27	13	S19400-10R0	RESISTOR,MF,1/4W,10.0,1%
R5,R9	2	S19400-2001	RESISTOR,MF,1/4W,2.00K,1%
R6	1	S19400-2213	RESISTOR,MF,1/4W,221K,1%
R7	1	S19400-1000	RESISTOR,MF,1/4W,100,1%
R10,R12,R15	3	S19400-1003	RESISTOR,MF,1/4W,100K,1%
R11	1	S19400-6191	RESISTOR,MF,1/4W,6.19K,1%
R16,R22	2	S19400-1001	RESISTOR,MF,1/4W,1.00K,1%
R28,R29,R30,R31,R32	5	T14648-9	RESISTOR,WW,5W,2.5K,5%,SQ
T1	1	T12737-7	TRANSFORMER,PULSE,3-WINDING
T2	1	M19612	CURRENT-TRANSDUCER,125-TURN
X1	1	M13552-3	IC,CONVERTER,V/F,654
X2	1	S15128-10	VOLTAGE REF,ADJ, PECISION,431I

UNLESS OTHERWISE SPECIFIED TOLERANCE
MANUFACTURING TOLERANCE PER E2056
ON 2 PLACE DECIMALS IS ± .02
ON 3 PLACE DECIMALS IS ± .002
ON ALL ANGLES IS ± .5 OF A DEGREE
MATERIAL TOLERANCE ("t") TO AGREE WITH PUBLISHED STANDARDS.
DO NOT SCALE THIS DRAWING

"X" INFO.: XD-RW
Chg. Sheet No.: 5-11-2001F
DESIGN INFORMATION
DRAWN BY: F.V
ENGINEER: L. C.
APPROVED:
REFERENCE: G3734-1
SUPERSEDING:
EQUIPMENT TYPE: INVERTER WELDERS
SUBJECT: SWITCH P.C. BOARD AS'BLY
SCALE: 1:1 DATE: 10-3-2000 DRAWING No.: G 3734-2

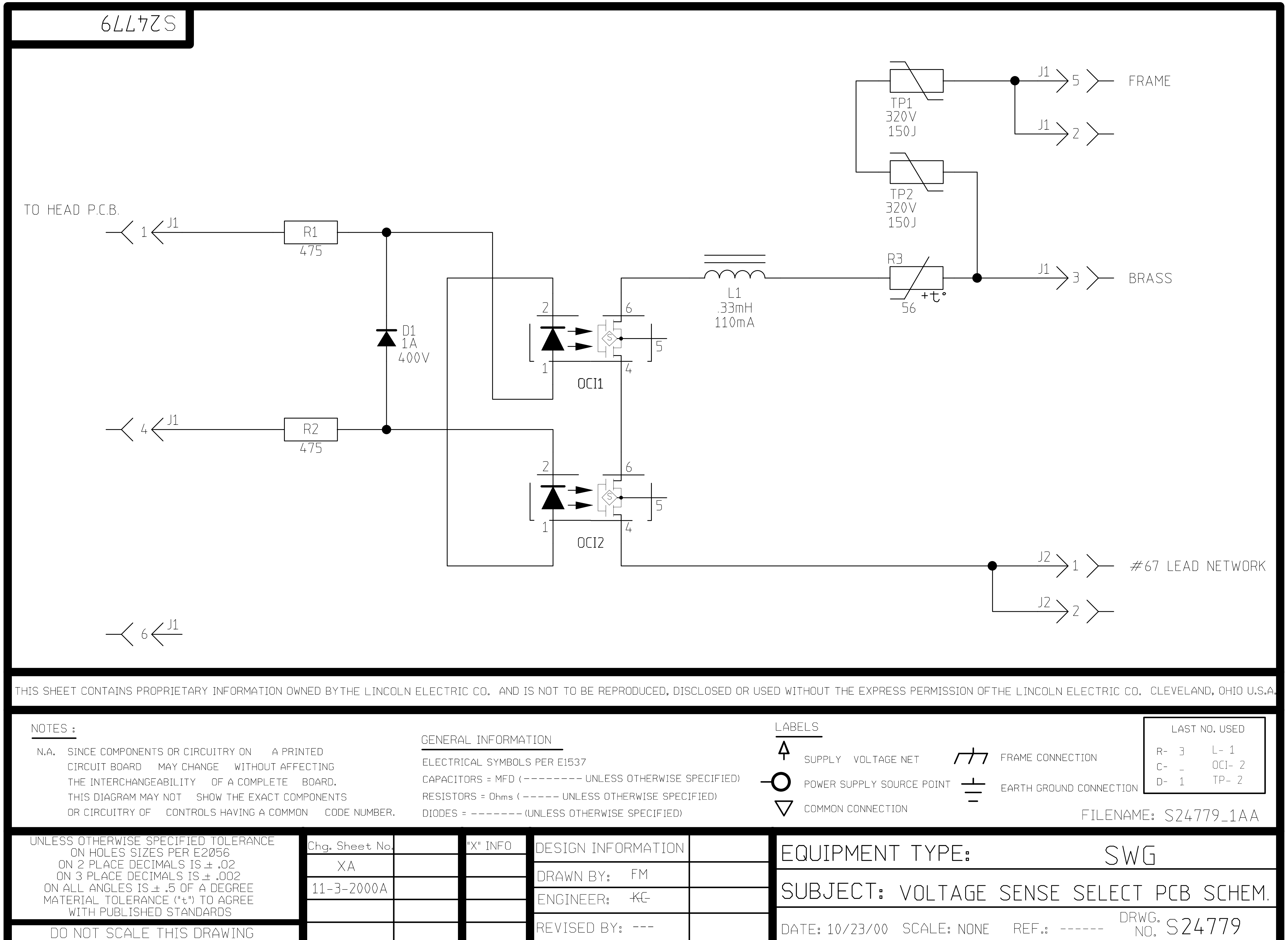
SOLID EDGE

EN-170

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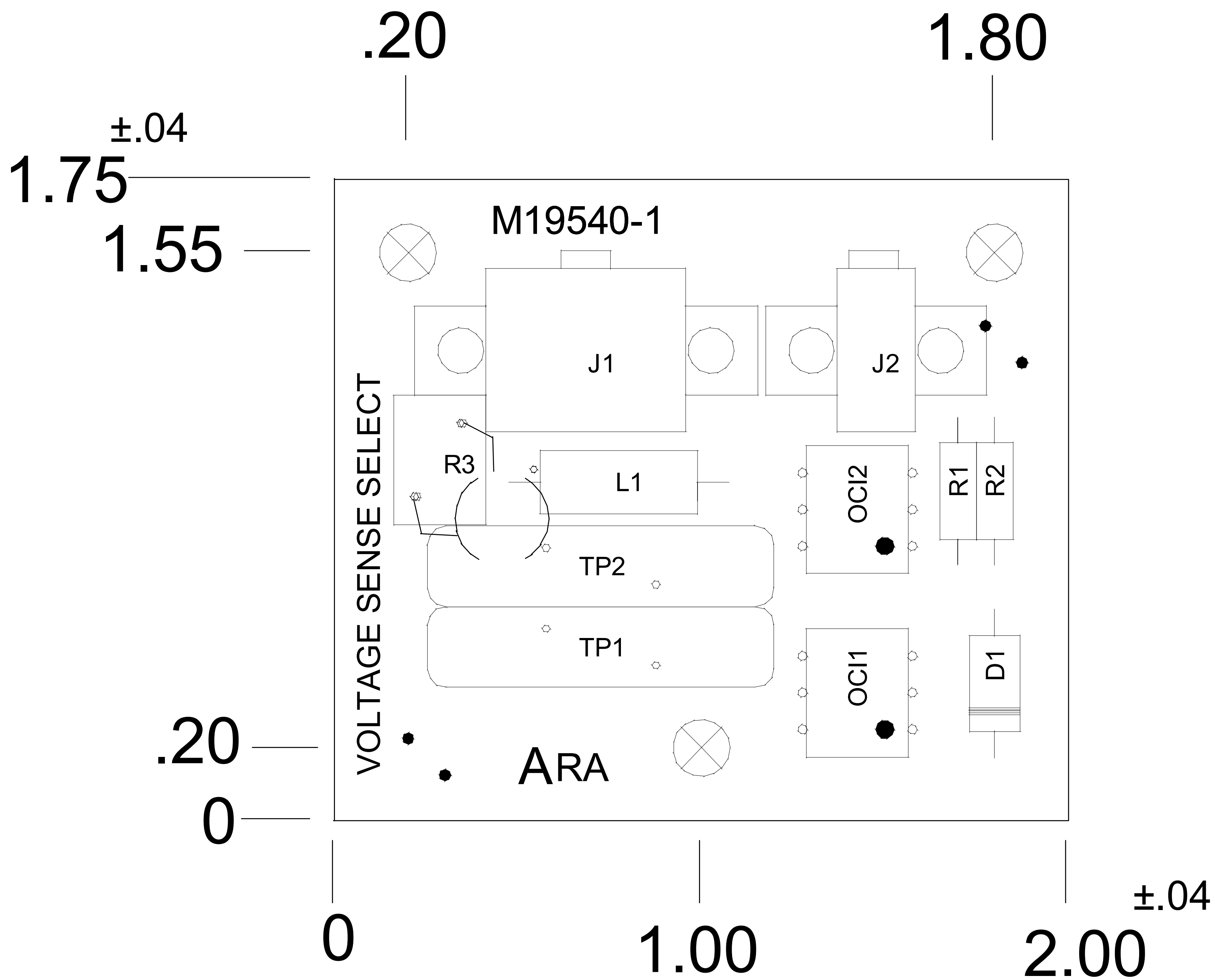
SCHEMATIC - VOLTAGE SENSE PC BOARD



NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.

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PC BOARD ASSEMBLY-VOLTAGE SENSE



ITEM	REQD	PART NO.	IDENTIFICATION
D1	1	T12199-1	1N4004
J1	1	S24020-6	HEADER
J2	1	S24020-2G	HEADER
L1	1	T12218-7	330uH
OCI1,OCI2	2	S15000-20	PHOTO FET
R1,R2	2	S19400-4750	475 1/4W
R3	1	S18380-1	THERMISTOR,PTC
TP1,TP2	2	T13640-18	160J

CAPACITORS = MFD/VOLTS
RESISTORS = OHMS
INDUCTANCE = HENRYS

COMMON DIGITAL CONTROLS
VOLTAGE SENSE SELECT P.C. BD AS'BLY

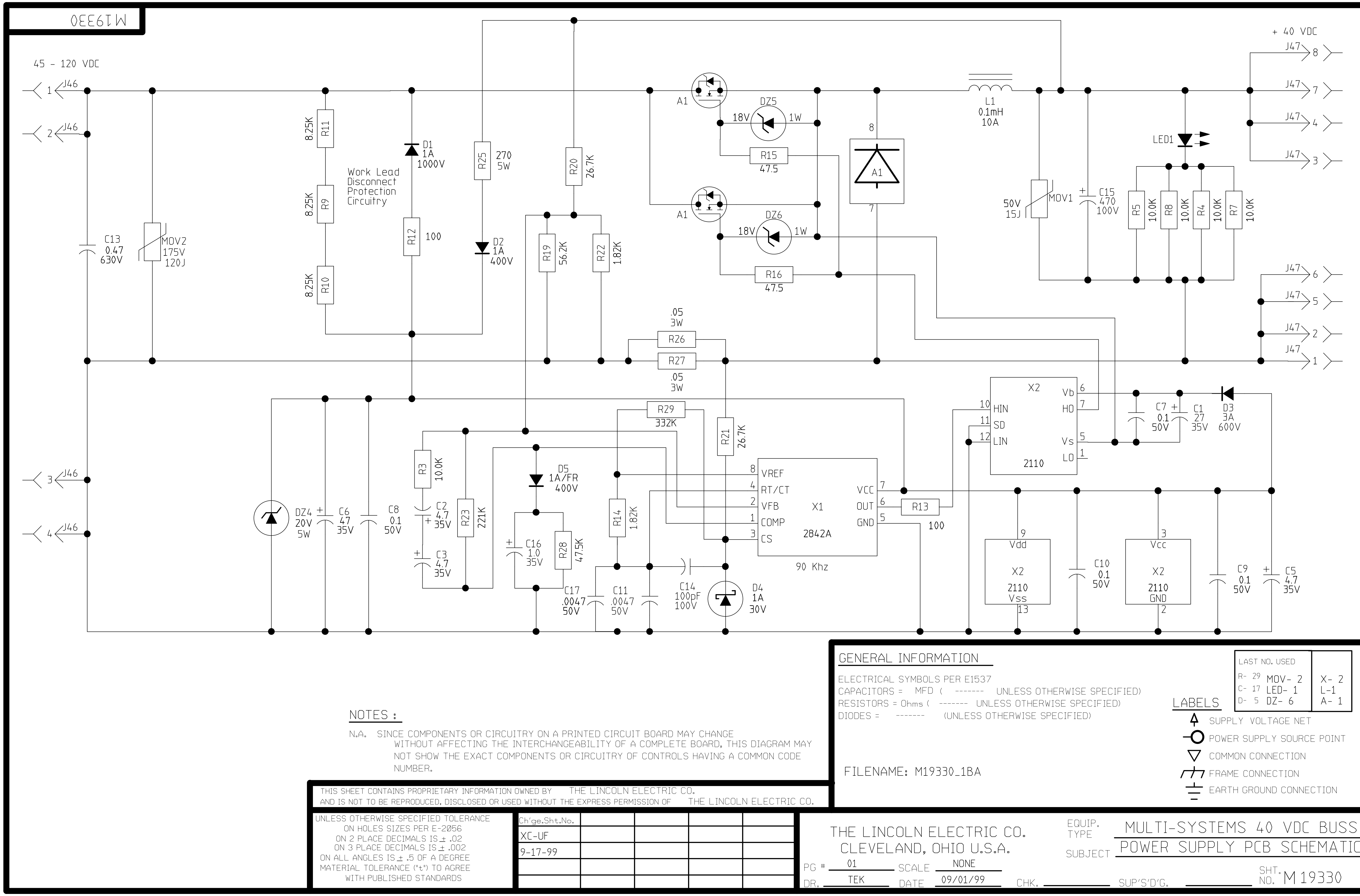
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M19540-1

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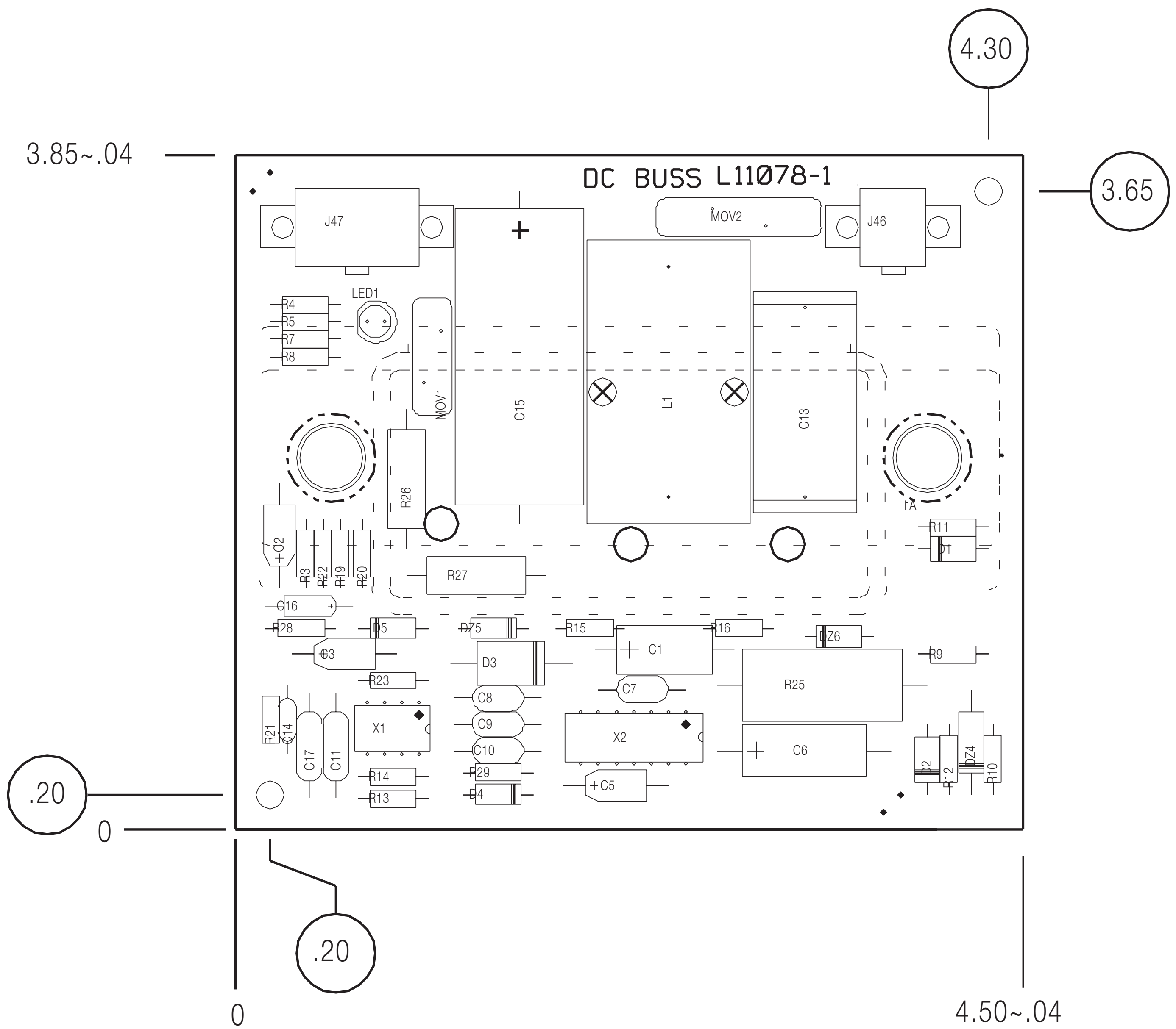
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SCHEMATIC - 40 VDC BUS PC BOARD



NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual.

PC BOARD ASSEMBLY-40 VDC BUS



ITEM	REQ'D	PART NO	IDENTIFICATION
X1	1	M15458-4	IC,PWM-CONTROLLER,IMODE,2842A
C2,C3,C5	3	S13490-25	CAPACITOR,TAEL,4.7,35V 10%
C16	1	S13490-42	CAPACITOR,TAEL,1.0,35V,10%
C6	1	S13490-66	CAPACITOR,TAEL,47,35V 10%
C1	1	S13490-93	CAPACITOR,TAEL,27,35V,10%
C15	1	S13490-174	CAPACITOR,ALEL,470,100V,+50/-10%
X2	1	S15018-16	IC,CMOS,DRIVER,MOSFET,2110(SS)
C14	1	S16668-3	CAPACITOR,CEMO,100P, 100V,5%
C11,C17	2	S16668-10	CAPACITOR,CEMO,4700P, 50V,2%
C7,C8,C9,C10	4	S16668-11	CAPACITOR,CEMO,0.1, 50V,10%
R15,R16	2	S19400-47R5	RESISTOR,MF,1/4W,47.5,1%
R12,R13	2	S19400-1000	RESISTOR,MF,1/4W,100,1%
R3,R4,R5,R7,R8	5	S19400-1002	RESISTOR,MF,1/4W,10.0K,1%
R14,R22	2	S19400-1821	RESISTOR,MF,1/4W,1.82K,1%
R23	1	S19400-2213	RESISTOR,MF,1/4W,221K,1%
R20,R21	2	S19400-2672	RESISTOR,MF,1/4W,26.7K,1%
R29	1	S19400-3323	RESISTOR,MF,1/4W,332K,1%
R28	1	S19400-4752	RESISTOR,MF,1/4W,47.5K ,1%
R19	1	S19400-5622	RESISTOR,MF,1/4W,56.2K,1%
R9,R10,R11	3	S19400-8251	RESISTOR,MF,1/4W,8.25K,1%
C13	1	S20500-2	CAPACITOR,PPMF,0.47,630V,10%,BOX
J46	1	S24020-4	CONNECTOR,MOLEX,MINI,PCB,4-PIN,TIN
J47	1	S24020-8	CONNECTOR,MOLEX,MINI,PCB,8-PIN,TIN
D2	1	T12199-1	DIODE,AXLDS,1A,400V
D1	1	T12199-2	DIODE,AXLDS,1A,1000V
L1	1	T12218-16	CHOKE,HIGH-CURRENT,100UH,10A,10%, LOW
R26,R27	2	T12300-86	RESISTOR,WW,3W,0.05,1%
DZ4	1	T12702-25	ZENER DIODE,5W,20V,5% 1N5357B
DZ5,DZ6	2	T12702-45	ZENER DIODE, 1W,18V,5% 1N4746A
D4	1	T12705-23	DIODE,AXLDS,1A,30V,SCHOTTKY,1N5818
D5	1	T12705-34	DIODE,AXLDS,1A,400V,FR,1N4936
D3	1	T12705-59	DIODE,AXLDS,3A,600V,UFR
MOV1	1	T13640-15	MOV,50VRMS,15J,14MM
MOV2	1	T13640-24	MOV,175VRMS,120J,20MM
LED1	1	T13657-2	LED,T-1,3/4,RED,HLMP-3003
R25	1	T14648-17	RESISTOR,WW,5W,270,5%,SQ

CAPACITORS = MFD/VOLTS
RESISTORS = OHMS, 1/4 WATT (UNLESS OTHERWISE SPECIFIED)

MULTI-WELD 350
40V DC BUS P.C. BOARD ASSEMBLY
9-22-2000
L11078-1

NOTE: Lincoln Electric assumes no responsibility for liablilities resulting from board level troubleshooting. PC Board repairs will invalidate your factory warranty. **Individual Printed Circuit Board Components are not available from Lincoln Electric.** This information is provided for reference only. Lincoln Electric discourages board level troubleshooting and repair since it may compromise the quality of the design and may result in danger to the Machine Operator or Technician. Improper PC board repairs could result in damage to the machine.

SVM ERROR REPORTING FORM

We need to know if there are errors in our manuals. We also value any suggestions as to additional tests or procedures that would make this SVM a better tool for you.

If you discover new or different “Problems or Symptoms” that are not covered in the three column troubleshooting chart, please share this information with us. Please include the machine’s code number and how the problem was resolved.

Thank You,
Technical Services Group
Lincoln Electric Co.
22801 St. Clair Ave.
Cleveland, Ohio 44117-1199

FAX 216-481-2309

SVM Number ___________________________

Page Number if necessary__________________

Your Company___________________________

Your Name______________________________

Please give detailed description below:

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